L.E. CARPENTER AND COMPANY
1301 East Ninth Street
Suite 3600
Cleveland, Ohio 44114-1824

FINAL SUPPLEMENTAL REMEDIAL INVESTIGATION ADDENDUM FOR L.E. CARPENTER AND COMPANY

September 1992

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MANAGERS DESIGNERS/CONSULTANTS

L.E. CARPENTER AND COMPANY
SUPPLEMENTAL REMEDIAL INVESTIGATION ADDENDUM

W.O. No.: 6720-02-05

September 1992

Prepared for:

L.E. CARPENTER AND COMPANY
1301 East Ninth Street
Suite 3600
Cleveland, Ohio 44114-1824

Prepared by:

ROY F. WESTON, INC.
Raritan Plaza I
4th Floor
Raritan Center
Edison, New Jersey 08837

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EXECUTIVE SUMMARY

L.E. Carpenter and Company (L.E. Carpenter) is pleased to present this Supplemental Remedial Investigation Addendum (SRIA) for the former manufacturing facility located in Wharton, New Jersey. In accordance with the NJDEPE Amended Administrative Consent Order (ACO), Roy F. Weston, Inc. (WESTON®) has completed supplemental investigations in an effort to further characterize the vertical and horizontal extent of contamination originating from the former L.E. Carpenter facility.

This SRIA has been prepared in response to specific requests by the New Jersey Department of Environmental Protection and Energy (NJDEPE) for additional investigation activities at the L.E. Carpenter site located in Wharton, New Jersey. This report has been prepared by WESTON on behalf of L.E. Carpenter. The original report of Remedial Investigation Findings was prepared through a cooperative effort by GeoEngineering, Inc. of Denville, New Jersey, and WESTON and submitted to the NJDEPE in June 1990. In response to specific requests by NJDEPE for additional information, a Supplemental Remedial Investigation (SRI) was conducted by WESTON in August 1990, and documented in a report submitted in November 1990. NJDEPE requested additional investigations during 1991. Various field efforts were completed by WESTON in 1991 and reported to NJDEPE as each effort was completed. This supplemental report addendum will present and summarize the findings of the investigative efforts completed since submittal of the SRI Report. This report will resolve the remaining issues related to the remedial investigation for the site.

Specifically, the following issues identified by NJDEPE required resolution and are discussed in this document:

- Extent of Free Product Migration;
- Extent of Groundwater Contamination;
- The Use and Interpretation of Background Levels of Contaminants;
- Use of Qualified Data Collected During the RI;
- Domestic Groundwater Use Within One Mile of the Site;
- Site Geologic Profiles Presented in the RI;
- 500-Year Flood Plain Delineation;
- Wetlands Survey; and
- Cultural Resource Survey.

The findings of the investigations conducted since the SRI are also presented in this document. Namely, additional sediment and groundwater sampling was completed in 1991, as well as additional groundwater monitoring well installation and sampling in 1992. An investigation of potential on-site disposal areas was also completed in 1992.

The conclusions based upon the most recent data as well as the findings of the RI and SRI are summarized as follows:

- Extent of Free Product Migration: Based on groundwater sampling results and findings from the most recent geohydrologic investigations, the floating product layer does not extend to the abandoned sewer line. It has, thus far, not impacted the Rockaway River and appears to be restricted to the central portion of the site.

- Extent of Groundwater Contamination: Consistent with historical measurements, shallow groundwater is flowing in a northeasterly direction and is discharging to the drainage ditch. The Rockaway River, adjacent to the site, has consistently acted as a recharge zone. Intermediate groundwater is flowing in a northeasterly direction as well.

  Contamination originating from L.E. Carpenter in the shallow groundwater zone is bounded by the Air Products drainage ditch to the north and MW-25 to the east. With the exception of MW-11I, no contamination has been detected in the intermediate or deep aquifer zones. There still remains the possibility of off-site contamination in the shallow zone on the Air Products property. NJDEPE has requested that additional wells (i.e., below the clay layer) be installed downgradient (on the Air Products property) during the Remedial Design stage of the project.

- The Use and Interpretation of Background Levels of Sediment Contaminants: WESTON evaluated all of the sediment sampling results in light of the background data collected by the United States Geological Survey (U.S.G.S.). The background data collected during the RI and SRI are consistent with those concentrations of compounds found in sediments in the USGS data. Sediment contaminants are localized in those areas immediately adjacent to the site. Locations downstream of the facility have not been impacted by L.E. Carpenter. Likewise, surface water conditions in the Rockaway River have not been impacted.

- Domestic Groundwater Use Within One Mile of the Site: All potential groundwater supply wells were identified within one mile of the facility. The downgradient area consists of the shallow (glacial) alluvial aquifers within the Rockaway River valley to the east and southeast of the site. Two wells were located downgradient of the site. One of those wells is no longer in service and the other is a public supply well operated by the Borough of Wharton. No evidence exists to suggest that downgradient receptor wells could be impacted by shallow groundwater contamination originating from L.E. Carpenter.

- Site Geology: Incorporation of the most recent geohydrologic investigation necessitated modification to the soil profiles presented in the original RI document.

- 500-Year Floodplain: Those areas of the site west of the railroad Right-of-Way are impacted by the 500-year floodplain delineation. The areas of the site which will undergo remediation are outside both the 100- and 500-year floodplains.

- Cultural Resource Survey: L.E. Carpenter contracted for completion of a Stage 1A Cultural Resource Survey (CRS). The findings of the Stage 1A CRS suggest that the L.E. Carpenter site poses a moderate potential to contain artifacts of archeological importance in areas not previously disturbed. The primary area requiring remediation has previously been disturbed from mining activities to a depth of five feet.

- Wetlands Survey: The extent of wetland areas include the Wharton Enterprises property along the Rockaway River and portions of the Air Products property along the drainage ditch. The wetland survey found areas on-site and adjacent to the site of ordinary resource value. The wetlands were ranked as having a low to moderate social significance given the historical industrial nature of the surrounding area. Wetland areas will not restrict the planned remedial activities.

- Disposal Area Investigation: WESTON conducted a supplemental investigation in February 1992 to evaluate an area suspected of containing buried 55-gallon drums. During the execution of the investigation, an area approximately 8,500 square feet was formerly used for debris and waste disposal.

Based upon the information and conclusions presented in this document, as well as the RI and SRI, L.E. Carpenter has adequately defined the horizontal and vertical extent of contamination in all media. There remains one unresolved issue related to the potential for off-site migration of contaminants in groundwater in the shallow zone (beneath the clay layer) to the north of the site.

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SECTION 1.0

INTRODUCTION

This Supplemental Remedial Investigation Addendum (SRIA) has been prepared in response to specific requests by the New Jersey Department of Environmental Protection and Energy (NJDEPE) for additional investigation activities at the L.E. Carpenter site located in Wharton, New Jersey. This report has been prepared by Roy F. Weston, Inc. (WESTON®) on behalf of L.E. Carpenter and Company (L.E.Carpenter). The original report of Remedial Investigation Findings was prepared through a cooperative effort by GeoEngineering, Inc. of Denville, New Jersey, and WESTON and submitted to the NJDEPE in June 1990. In response to specific requests by NJDEPE for additional information, a Supplemental Remedial Investigation (SRI) was conducted by WESTON in August 1990, and documented in a report submitted in November 1990. NJDEPE requested additional investigations during 1991. Various field efforts were completed by WESTON in 1991 and reported to NJDEPE as each effort was completed. This supplemental report addendum will present and summarize the findings of the investigative efforts completed since submittal of the SRI Report. It is intended that this report will resolve the remaining issues related to the remedial investigation for the site.

1.1 Purpose and Objective of this Report

In accordance with the 26 September 1986 Administrative Consent Order (ACO), L.E. Carpenter has completed various investigative activities in order to determine the nature and extent of soils and groundwater contamination that may have resulted from operations at the former L.E. Carpenter manufacturing facility located in Wharton, New Jersey. L.E. Carpenter has completed a RI and SRI in order to adequately define the scope of the problem associated with the possible discharge of pollutants from the facility during the period of operation from 1943 to 1987.

The various investigations conducted in order to fully characterize the nature and extent of possible contamination have been completed in several phases. The RI was completed in 1989 and reported to NJDEPE in June 1990. NJDEPE accepted the findings and conclusions of that investigation provided that additional investigations be completed in response to the questions raised during review of the revised RI report. A SRI was completed in August 1990 and reported to NJDEPE in November 1990. Several issues were identified as a result of the findings of the SRI and NJDEPE requested additional investigative activities. In the interest of concluding the investigative RI efforts, L.E. Carpenter requested a meeting with NJDEPE in August 1991 to definitively outline the unresolved issues related to the RI/SRI. Those issues are summarized as follows:

- Extent of Free Product Migration: The extent of free product migration onto the Wharton Enterprises property was to be determined; especially as it related to the area between the Rockaway River and the abandoned sewer line. Additional groundwater monitoring wells were requested, as was a determination of the integrity of monitoring well MW-14s.

- Extent of Groundwater Contamination: NJDEPE requested that the extent of groundwater contamination be further investigated as it related to the Wharton Enterprises and Air Products properties. In addition, the direction of groundwater flow in the shallow zone in the vicinity of the drainage ditch located between the L.E. Carpenter site and Air Products property was challenged by NJDEPE. NJDEPE requested that additional monitoring wells be installed on the Wharton Enterprises and Air Products properties.

- The Use and Interpretation of Background Levels of Contaminants: NJDEPE requested that site specific sediment sampling data be evaluated and compared to data collected from the Rockaway River by the United States Geological Survey (USGS) (Smith, et.al; 1987).

- Use of "Qualified" Data Collected During the RI: NJDEPE questioned the use of surface water data previously submitted based upon general laboratory QA/QC concerns. The department determined that the subject data can be utilized provided qualifications are noted.

- Domestic Groundwater Use Within One Mile of Site: NJDEPE requested further clarification and determination of groundwater usage within one mile of the site.

Additional questions and issues were raised during the review of the Draft Feasibility Study (FS) submitted in May 1991 which required resolution. Those issues, which are typically addressed in the RI, are as follows:

- Site Geology: Several comments were made by NJDEPE during review of the draft FS regarding the prevalent subsurface soil features and geologic formations. It became evident that the hydrogeologic profiles presented in the RI were lacking sufficient specificity as it related to the primary geologic features. The profiles required revision.

- 500-year Flood Plain Delineation: NJDEPE requested that the 500-year flood plain be delineated on the site and surrounding area.

- Wetlands Survey: NJDEPE requested that a Wetland Survey be completed.

- Cultural Resource Survey: NJDEPE requested that a Cultural Resource Survey (CRS) be completed.

Several requests for additional investigations and sampling were made by NJDEPE since submittal of the RI and SRI. Those investigations and resultant findings will also be discussed in this document. The separate investigations and completion dates are as follows:

- Additional Sediment Sampling (March 1991).
- Additional Groundwater Sampling (July 1991).
- Disposal Area Investigation (January 1992).
- Additional Groundwater Monitoring Well Installation and Sampling (February 1992).

The purpose and objective of this document is to report on the investigative activities completed since the submission of the RI and SRI, conclusively resolve the outstanding issues identified during the meeting with NJDEPE in August 1991, present the results of the surveys requested as a result of the FS review, and revise previously submitted information based upon data gathered during the recent investigations.

1.2 Site Background

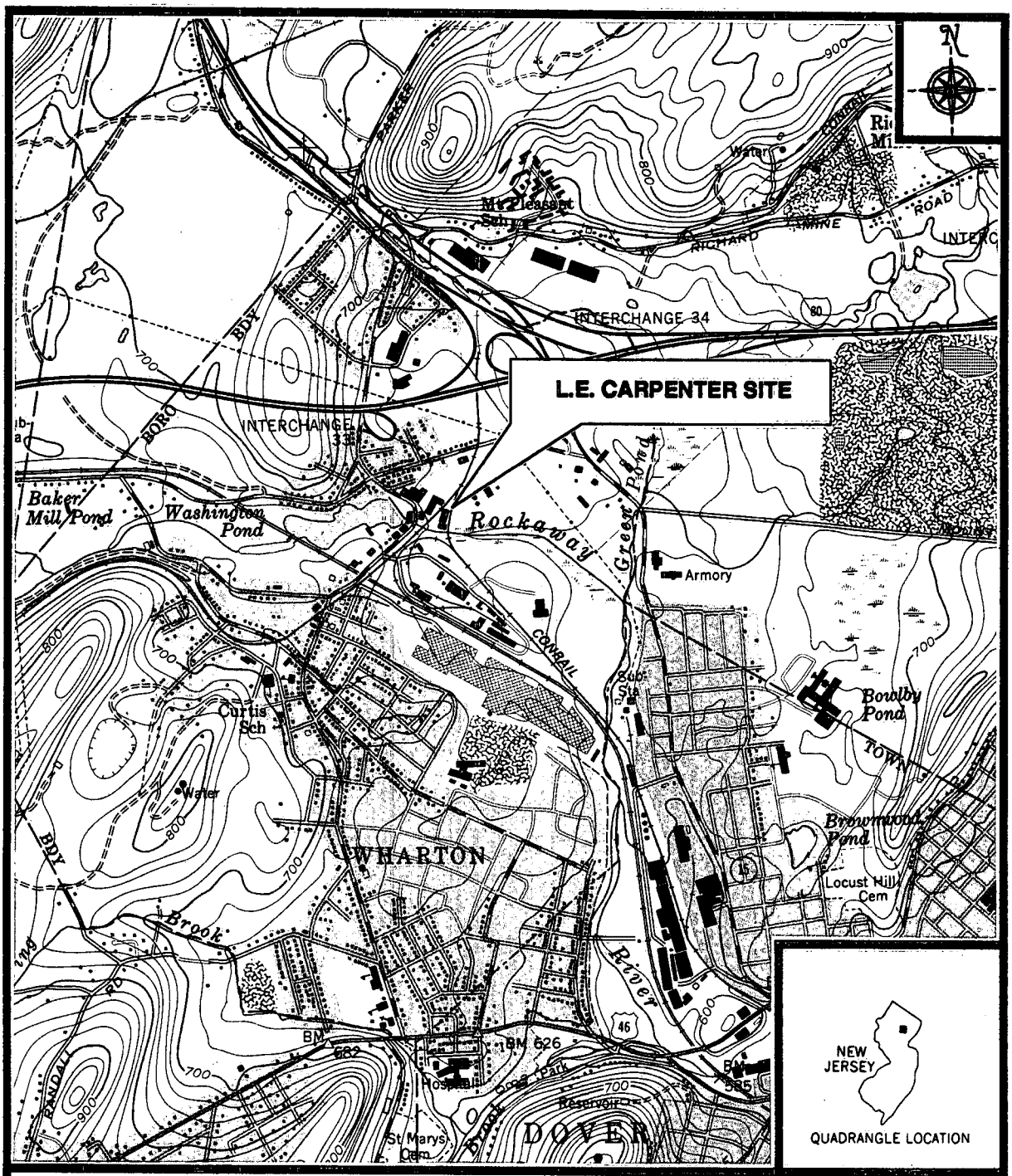
A detailed description of the site history is provided in the "Revised Report of Remedial Investigation Findings" (June 1990). A summary of that information is provided in this report.

The L.E. Carpenter facility is located at 170 North Main Street, Borough of Wharton, Morris County, New Jersey. The location of the facility is shown in Figure 1-1, Topographic Map of the L.E. Carpenter Facility, Wharton, New Jersey. The facility comprises Block 301, Lot 1 and Block 703, Lot 30 on the tax map of the Borough of Wharton.

L.E. Carpenter has owned this facility since 1943. The facility was designed and operated as a manufacturing facility for vinyl wall coverings from 1943 to 1987. It is currently utilized as subleased warehouse space and manufacturing.

Figure 1-2 depicts the major features of the site and illustrates the immediate environmental setting. The site occupies approximately 14.6 acres northwest of the intersection of the Rockaway River and North Main Street. The site is situated within a commercial/industrial area. The Rockaway River borders the site to the south; a vacant lot lies to the east; and a large compressed gas facility (Air Products Inc.) borders the site to the northeast. Additional industrial sites are located to the south of the site. The residential portion of the Borough of Wharton is separated from the site by Ross Street, which is located on the northwestern side of the site.

The site is located within the Dover Mining District, which is one of the oldest mining districts in the country. Iron ore was extracted from three mines in the vicinity of the site from the late 1800s to the early 1900s. The Washington Forge Mine and the West Mount Pleasant Mine were located directly on what is currently the L.E. Carpenter property (Sims, 1958). The Washington



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L.E. CARPENTER SITE
WHARTON, NJ.

FIGURE 1-1
SITE LOCATION MAP

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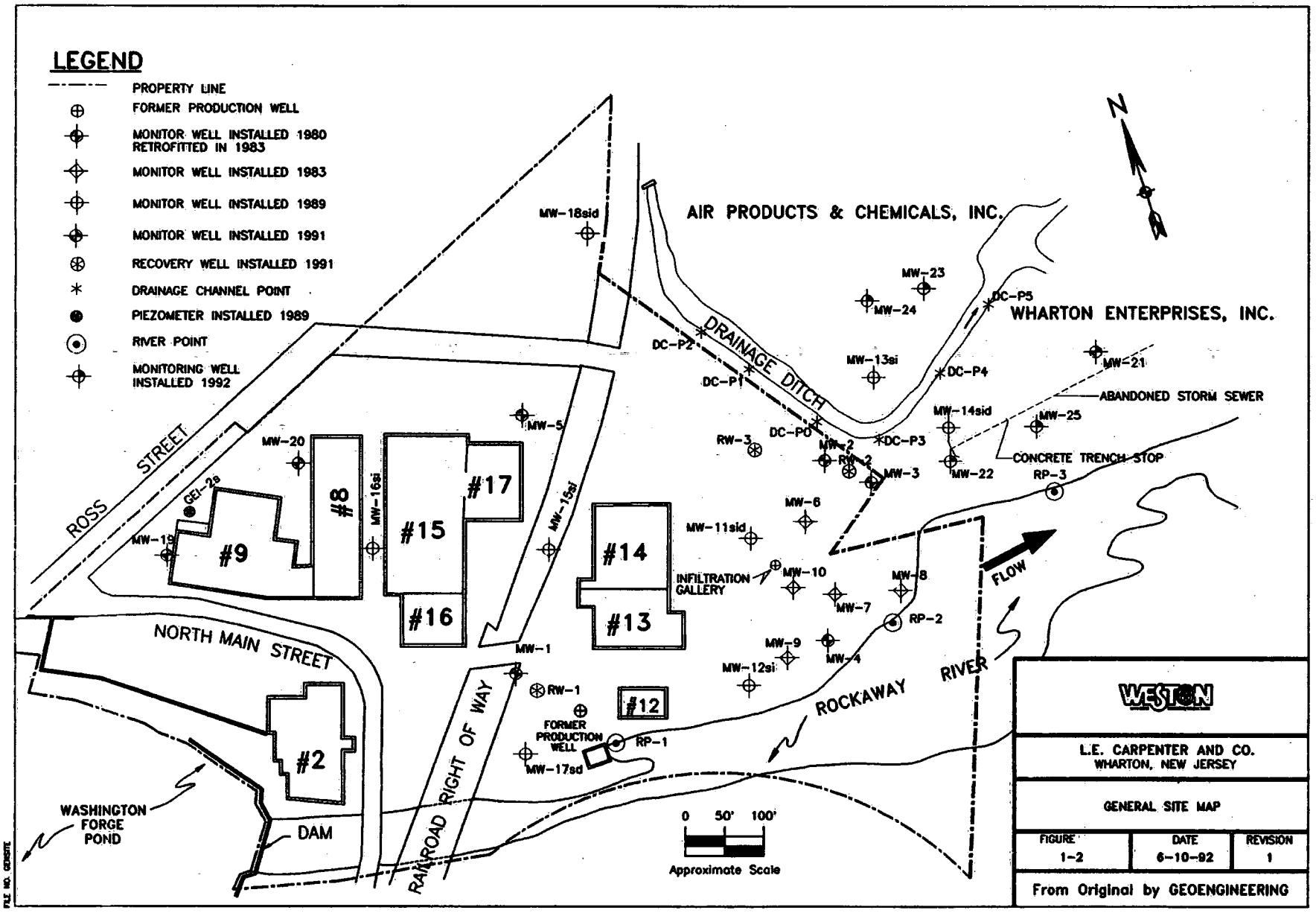
LEGEND
PROPERTY LINE
FORMER PRODUCTION WELL
MONITOR WELL INSTALLED 1980 RETROFITTED IN 1983
MONITOR WELL INSTALLED 1983
MONITOR WELL INSTALLED 1989
MONITOR WELL INSTALLED 1991
RECOVERY WELL INSTALLED 1991
DRAINAGE CHANNEL POINT
PIEZOMETER INSTALLED 1989
RIVER POINT
MONITORING WELL INSTALLED 1992
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
ROSS STREET
NORTH MAIN STREET
DRAINAGE DITCH
ABANDONED STORM SEWER
CONCRETE TRENCH STOP
INFILTRATION GALLERY
FORMER PRODUCTION WELL
RAILROAD RIGHT OF WAY
ROCKAWAY RIVER
FLOW
WASHINGTON FORGE POND
DAM
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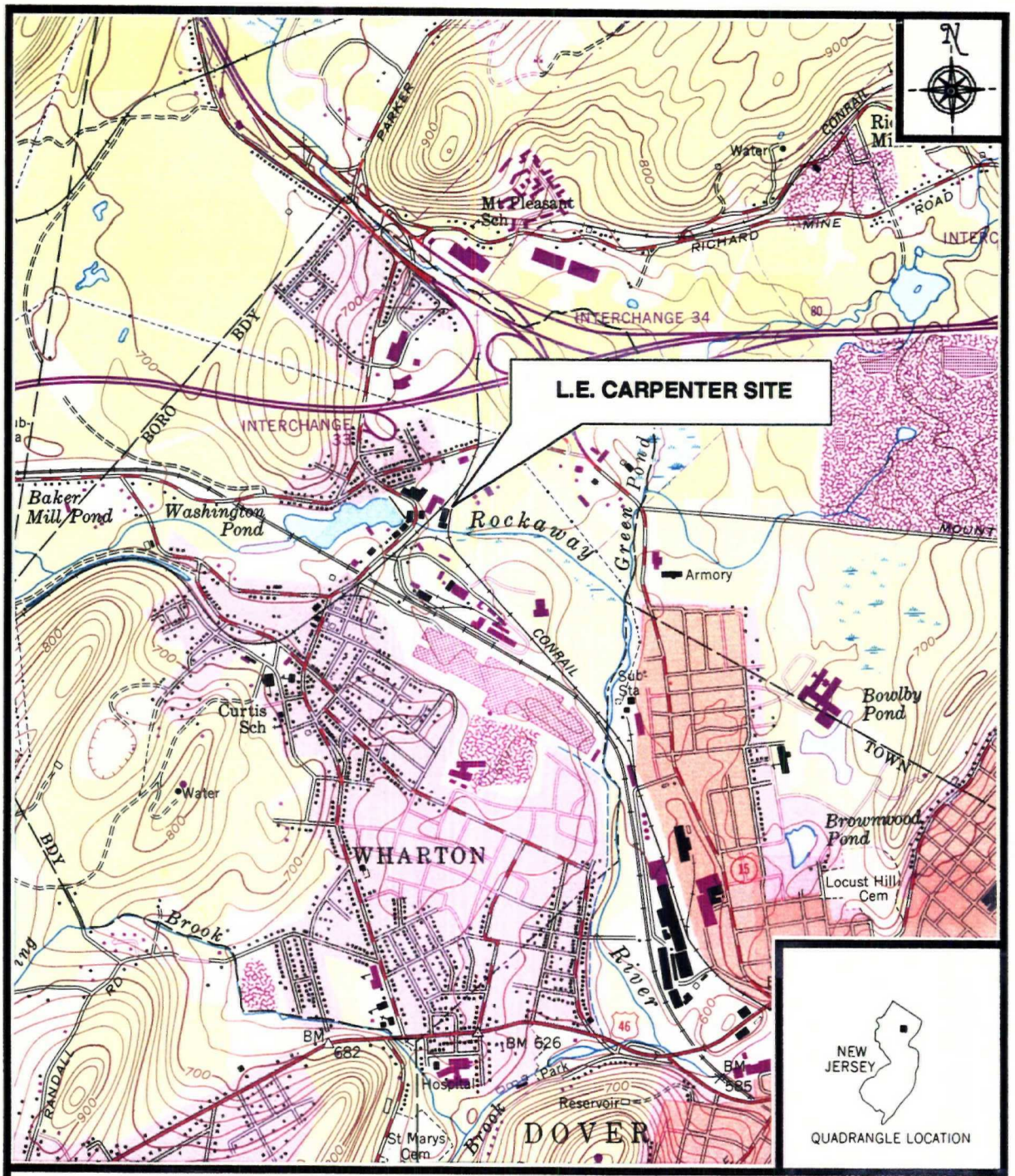
DC-P1
DC-P2
DC-P3
DC-P4
DC-P5
GEI-2s
0 50' 100'
Approximate Scale
WESTON
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
GENERAL SITE MAP
FIGURE 1-2
DATE 6-10-92
REVISION 1
From Original by GEOENGINEERING
FILE NO. GEOSITE



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L.E. CARPENTER SITE
WHARTON, NJ.

FIGURE 1-1
SITE LOCATION MAP

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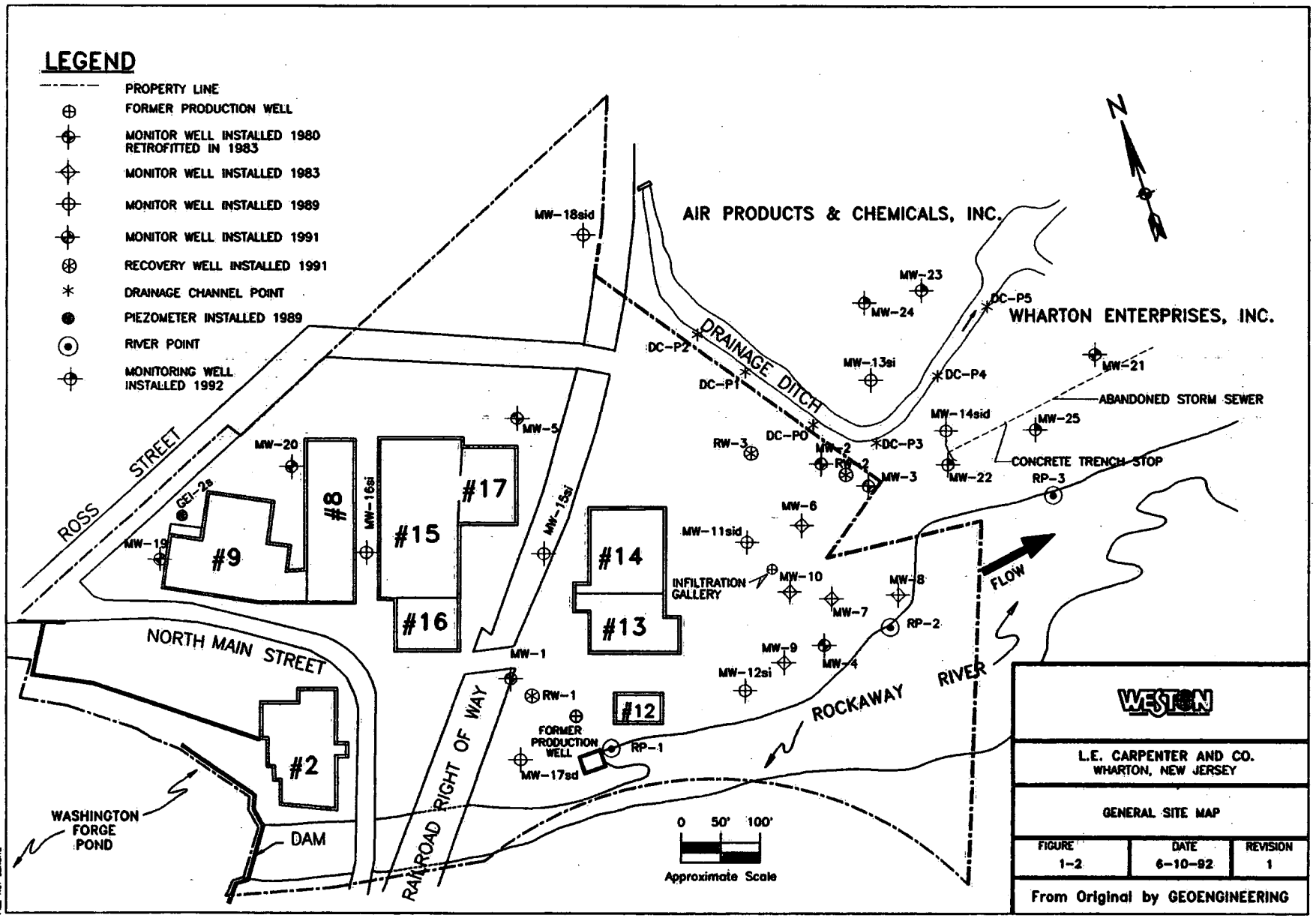
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PIEZOMETER INSTALLED 1989
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RW-3
RP-1
RP-2
RP-3
DC-P0
DC-P1
DC-P2
DC-P3
DC-P4
DC-P5
GEI-2s
0 50' 100'
Approximate Scale
WESTON
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
GENERAL SITE MAP
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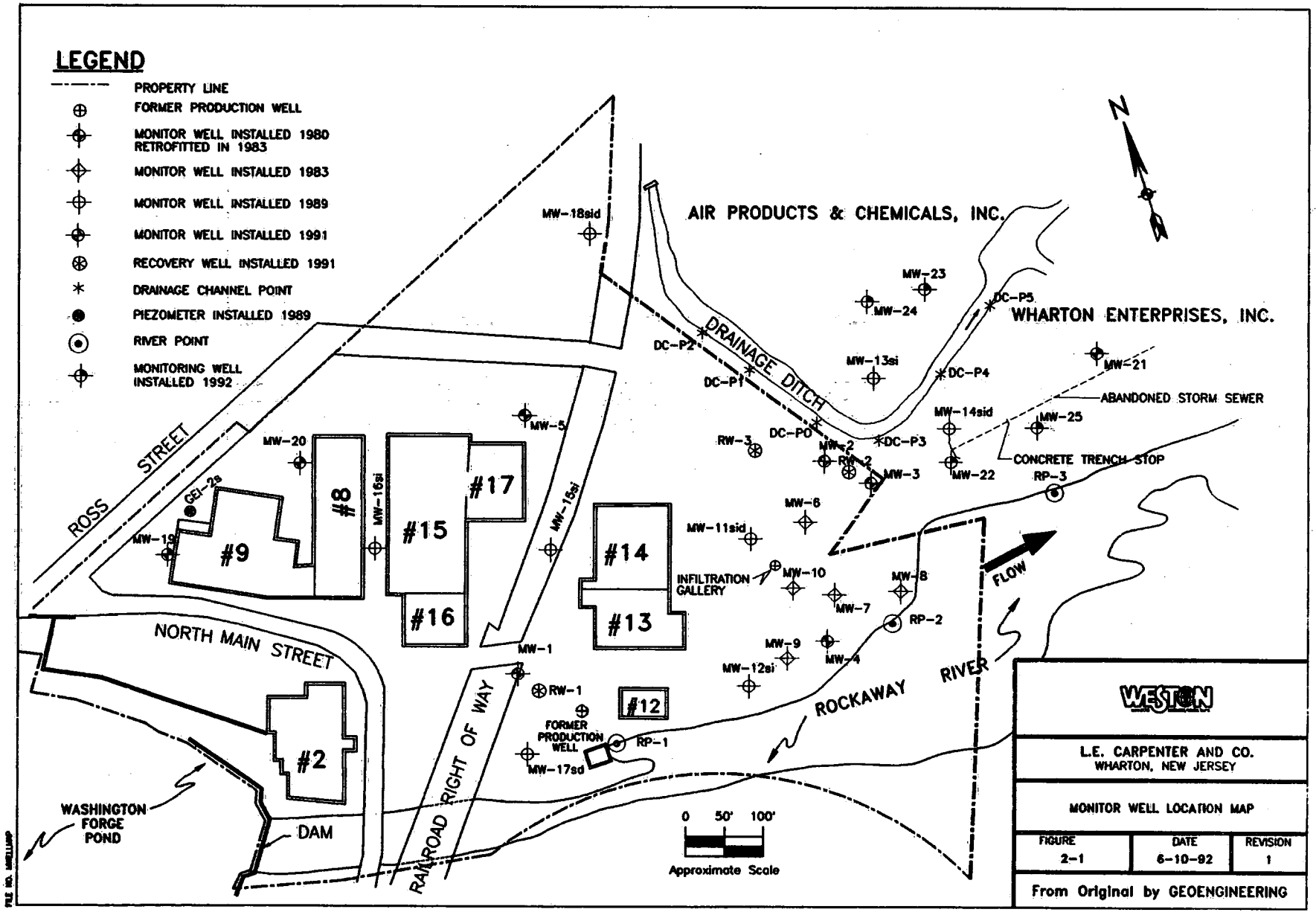
REVISION 1
From Original by GEOENGINEERING
FILE NO. GENSITE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RW-2
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RP-3
DC-P1
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DC-P3
DC-P4
DC-P5
DC-P6
GEI-2s
0 50' 100'
Approximate Scale
WESTON
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
MONITOR WELL LOCATION MAP
FIGURE 2-1
DATE 6-10-92
REVISION 1
From Original by GEOENGINEERING

Forge Mine was located in the approximate area of Building 16. The West Mount Pleasant Mine was located approximately 170 feet northeast of the Washington Forge Mine, in the general vicinity of Building 15. The Orchard Mine was located on the southern side of the Rockaway River, approximately 200 feet south of the Washington Forge Pond. The Washington Forge and West Mount Pleasant mines operated intermittently between 1868 and 1881. The Orchard Mine was operated intermittently between 1850 and 1910. Tailings from the Washington Forge and West Mount Pleasant mines are thought to have been disposed of on-site. A forge which serviced these and other local mines was operated at the Orchard mine site. Shipment of ore from and through the site may have adversely affected soil and groundwater quality.

The L.E. Carpenter facility was involved in the production of Victrix vinyl wall coverings from 1943 to 1987. The making of vinyl wall coverings involves several manufacturing processes which were carried out in the various buildings comprising the L.E.Carpenter facility. The first step in the process is referred to as lamination. Lamination involves the bonding of fabric to the vinyl film using a plastisol adhesive in conjunction with heat and pressure. The fabric/film laminate is then coated with a plastisol compound in order to texturize the material in preparation for printing. The printing process involves the application of decorative print patterns and/or protective topcoat finishes. When printing is completed, the product is inspected and packaged for shipment to the consumer. The facility was originally heated by coal and later converted to #6 fuel oil.

The manufacturing process involved the generation of waste solvents including xylene and methyl ethyl ketone, the collection of solvent fumes via "smog-hog" condensers, the collection of particulate matter via a dust collector, and the discharge of non-contact cooling water to the Rockaway River. During the period of operation, the L.E. Carpenter facility was operated in accordance with prevailing waste disposal regulations and environmental statutes. The facility operated several air pollution control devices permitted by NJDEPE and maintained a New Jersey Pollution Discharge Elimination System (NJPDES) Permit for the discharge of non-contact cooling water. From approximately 1963 until 1970, L.E. Carpenter disposed its wastes, including a polyvinyl chloride (PVC) waste material, into an unlined on-site impoundment.

In response to sampling efforts conducted by the NJDEPE in 1980 and 1981, L.E. Carpenter and NJDEPE entered into an ACO in 1982, which required L.E. Carpenter to:

- Remove the waste sludge from the unlined surface impoundment.
- Define the full extent of chemical compounds floating on the groundwater.
- Decontaminate the groundwater beneath the site as follows:
  - Remove the immiscible chemical compounds from the groundwater.
  - Remove dissolved volatile organic compounds (VOC), including hazardous substances from the groundwater beneath the site.

- Monitor groundwater quality according to the following schedule:
  - Collect samples to be analyzed for specific VOC every two months for a six-month period beginning on or about June 1982 and quarterly thereafter.
  - Take measurements every month to determine groundwater flow direction(s) and the thickness of the free floating organic compounds floating upon the groundwater.

On 24 February 1983, an Addendum (1983 Addendum) was added to the 1982 ACO to clarify its provisions.

Pursuant to the requirements of the 1982 ACO and the 1983 Addendum, L.E. Carpenter took the following actions: in April and May 1982, L.E. Carpenter removed over 4,000 cubic yards of waste from the surface impoundment and thereafter implemented a groundwater quality monitoring program. On 11 May 1984, L.E. Carpenter initiated removal of the immiscible chemical compounds from the top of the water table beneath the site using a passive recovery system.

On 26 September 1986, an additional ACO was entered into which superseded the 29 January 1982 ACO and the Addendum of 24 February 1983, except all requirements of the Groundwater Decontamination Plan dated 31 October 1983, as approved with conditions by NJDEPE on 26 January 1984 were incorporated. Under the terms of the Amended 26 September 1986 ACO, L.E. Carpenter initiated a RI/FS of its former manufacturing facility in Wharton, New Jersey.

The active production of vinyl wall coverings ceased in 1987. Since that time, the portion of the facility east of the railroad tracks has been inactive. Access is currently restricted to the area east of the railroad track by an eight-foot chain-link fence. The buildings west of the railroad tracks have been subleased as warehouse space and manufacturing operations.

1.3 Site Investigation and Remediation Activities

This subsection of the report will summarize the investigative and remediation activities completed to date as well as provide a chronology of documents previously submitted to the NJDEPE.

Several site investigation and remediation activities have been completed. Table 1-1 provides a chronology of major investigation and remediation efforts. In 1982, L.E.Carpenter removed 4,000 cubic yards of sludge and soil from the former surface impoundment. The starch drying beds were excavated and backfilled. Since May 1984, more than 5,000 gallons of floating product has been recovered from a series of recovery wells located primarily on the eastern side of the site. In 1991, the existing groundwater recovery system was upgraded and three additional recovery wells were installed in order to enhance the removal of the immiscible product.

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TABLE 1-1

CHRONOLOGY OF INVESTIGATIVE AND REMEDIATION ACTIVITIES

DATE	ACTIVITY	DESCRIPTION
1982	Remediation of surface impoundment Remediation and closure of starch drying beds	Excavation of 4,000 cubic yards of sludge and contaminated soils from former surface impoundment. Excavation and removal of starch drying beds.
1982	Installation of groundwater monitoring system and immiscible product recovery wells	Installation of a network of ten groundwater monitoring wells used to monitor extent of groundwater contamination and free product thickness. Five of the wells were equipped with skimmer pumps to recover floating product.
1989	Completion of remedial investigation	Completion of a soil gas survey, test pit and soil sampling, monitoring well installation and sampling, air sampling, and stream sediment and surface water sampling.
August 1989	Supplemental remedial investigation	Additional sampling of soil, test pit installation, surface water sediment, and background soils/sediment.
September 1989	Asbestos removal	Buildings 12, 13, and 14
January - March 1991	Decommissioning and tank closure	Decontamination and excavation of 16 storage tanks in accordance with NJDEPE approved Closure Plan.
March 1991	Additional sediment sampling	Collection of seven sediment samples from the Rockaway River including two from upgradient locations.
June 1991	Additional groundwater sampling	Sample collection from MW13-S and MWS3-I to confirm presence/absence of phthalate compounds. Also included installation and monitoring of MW-21 on Wharton Enterprises.
June 1991	Installation of recovery wells	Installation of three additional recovery wells as part of the enhancement of the immiscible product recovery system.
September 1991	Decontamination and decommissioning of structures in Building 9 and 13	Decontamination of building 9 interior; Decontamination and dismantling of former process piping, tanks, etc., in Building 13.
January 1992	Disposal area investigation	Installation of nine test pits in order to investigate and delineate the aerial extent of a former disposal area.
February 1992	Installation and sampling of additional groundwater wells	Installation and monitoring of four new shallow groundwater wells; two on Air Products property and two on Wharton Enterprises property.
December 1991 - January 1992	Demolition of Buildings 12, 13, 14	Buildings 12, 13, 14 razed.

In 1989, an extensive asbestos removal was completed in Buildings 12, 13, and 14. All underground and inactive aboveground storage tanks were decommissioned and removed from the facility in 1990 and 1991. The underground storage tanks were closed in accordance with procedures established by the NJDEPE Bureau of Underground Storage Tanks under an approved tank closure plan (August 1990).

All drummed raw materials have been removed from the site. In September 1991, the interior of building 9 and process piping, tanks and appurtances in Building 13 were decontaminated. Excess materials and wastes were disposed of off-site. In December 1991, Buildings 12 (former boiler house), 13, and 14 were razed.

The initial RI was completed in 1989. The SRI was completed in 1990 and several additional focused investigations were completed in 1991. Each investigation resulted in a submittal to NJDEPE. A chronology of document preparation is presented in Table 1-2.

1.4 Report Organization

Section 1.0 of this report summarizes the objectives and purpose of the document and various field efforts undertaken since completion of the SRI. Section 2.0 presents an overview of the specific investigative activities completed since the SRI. Physical characteristics of the site are discussed in Section 3.0. Section 4.0 presents a discussion of the nature and extent of contamination based upon the recent investigations and findings of the RI and SRI. Conclusions are presented in Section 5.0.

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TABLE 1-2

CHRONOLOGY OF DOCUMENT PREPARATION

DATE	DOCUMENT TITLE
June 1990	Revised Report of Remedial Investigation Findings
July 1990	Supplemental Remedial Investigation Work Plan
November 1990	Supplemental Remedial Investigation, L.E. Carpenter and Company Facility, Wharton, New Jersey
November 1990	Baseline Risk Assessment, L.E. Carpenter and Company Facility, Wharton, New Jersey (Draft)
April 1991	Draft Feasibility Study Report, L.E. Carpenter and Company Facility, Wharton, New Jersey
May 1991	Baseline Risk Assessment, L.E. Carpenter and Company, Wharton, New Jersey (Final)
June 1991	Additional Sediment Sampling Results: Supplemental Remedial Investigation Sampling
August 1991	Supplemental Groundwater Sampling, L.E. Carpenter and Company, Wharton, New Jersey
November 1991	Stage 1A Archeological Survey of the L.E. Carpenter and Company Property, Wharton Borough, Morris County, New Jersey
January 1992	Wetlands Assessment Report for L.E. Carpenter and Company Facility, Wharton Borough, Morris County, New Jersey
February 1992	Baseline Risk Assessment

SECTION 2.0

SITE CHARACTERIZATION ACTIVITIES

This section of the report will summarize the site characterization activities completed since the RI and SRI submittal. Each subsection will discuss the objectives, scope of effort, and procedure of the specific sampling task or survey. The results of the individual tasks are presented and discussed in Section 4.0.

2.1 Flood Plain Delineation

A "Floodway and Flood Hazard Area" map for the Rockaway River was obtained from the NJDEPE Division of Water Resources (see Plate 1). This map was evaluated in order to determine the extent of both the 100- and 500-year floodplains in the vicinity of the L.E. Carpenter site. This evaluation is summarized in Section 3.1.

2.2 Stage 1A Cultural Resource Survey

In August 1991, John Milner Associates of West Chester, Pennsylvania, was retained by L.E. Carpenter to perform a Stage IA Cultural Resource Survey (CRS). The survey, which consisted of a thorough literature review and pedestrian reconnaissance of the area, assessed the potential for the project area to possess significant prehistorical and/or historical archeological resources. The survey was conducted in accordance with the procedures outlined in the EPA Region II CERCLA/SARA Environmental Review Manual (and addressed the scope of work outlined in item 5d in the 24 June 1991 letter from Mr. Edgar Kaup, Case Manager, NJDEPE to L.E. Carpenter). Results of the CRS are discussed in Section 3.2 of this report.

2.3 Wetlands Assessment

In August 1991, Ecol Sciences, Inc. of Rockaway, New Jersey, was retained by L.E. Carpenter to perform a Wetlands Assessment to comply with the requirements of Executive Order 11990 and EPA's "Statement of Policy on Floodplains and Wetlands Assessment for CERCLA Actions." The purpose of this assessment was to identify the existence and possible extent of on-site and adjacent wetlands, to evaluate the functions and values of these wetlands, and to analyze potential impacts (as well as mitigation of those impacts) to project area wetlands associated with proposed remedial alternatives.

Wetland investigations were conducted on the subject property in October and November 1991. The presence and approximate limits of wetlands on the subject property were determined utilizing the "unified wetland delineation approach" as detailed within the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland

Delineation, 1989) as mandated within the New Jersey Freshwater Wetlands Protection Act rules (N.J.A.C. 7:7A). This approach generally requires a coincidence of hydric soils, positive hydrological indicators, and a prevalence of hydrophytic vegetation for a determination that an area is a wetland.

Soil samples were obtained utilizing a hand soil auger. Soil coloration to a depth of approximately 24 inches was determined by comparison to Munsell soil color charts and recorded along with soil texture. Mineral hydric soils usually exhibit one of the following color features in the horizon immediately below the A-horizon or ten inches (whichever is shallower); matrix chroma of two or less in mottled soils, or matrix chroma of one or less in unmottled soils. Organic soils are typically hydric.

Plant species occurring on-site were identified and compared to the National List of Plant Species that Occur in New Jersey Wetlands (USFWS, 1988). This list rates plant species according to their preference for hydric conditions based upon the following classification system:

OBL - Obligate	Essentially always found in wetlands 99%
FACW - Facultative Wetland	Usually found in wetlands 99-66%
FAC - Facultative	Sometimes found in wetlands 66-33%
FACU - Facultative Upland	Seldom found in wetlands 33%
UPL - Non-Wetland	Occurs in wetlands in another region but not in this region 1%

Additionally, if a species does not occur in wetlands, it is not on the list. At each soil boring location, the vegetation was recorded by species within the field of view. Ocular estimates of relative basal area for trees and cover for shrubs and herbs were made by species. If greater than 50 percent of the dominant species from all strata are classified as FAC, FACW, or OBL, then the vegetation is hydrophytic. Communities dominated by FACU or UPL species are hydrophytic if hydric soil and indicators of wetland hydrology are present. If the hydric soil and wetland hydrology criteria are met, then the vegetation is considered hydrophytic.

An evaluation of on-site hydrology was made by noting the depth to free water in the auger hole and evidence of surface ponding or flooding. Depth to the seasonal high water table was based on the depth to soil mottling as in the procedure utilized by the USDA Soil Conservation Service.

The vegetation, soil, and hydrology information described above was recorded on Wetland Data Sheets at each soil boring location. The wetland perimeter was approximated where the parameters were met as set forth in the manual.

In addition to freshwater wetlands, regulated State open waters were identified during the field investigation. Where State open waters occurred within wetlands, no approximation of these

areas was provided. Where State open waters were identified outside of wetlands, they are identified. The results of the wetlands assessment are summarized in Section 3.3 of this report.

2.4 Sediment Sampling

In response to a NJDEPE request to evaluate subsurface sediment conditions, a total of seven additional sediment samples were collected on 8 April 1991 from several locations in the Rockaway River. The primary objective of sampling was to further define the vertical extent of contamination previously identified in sediment samples collected from the river. During previous RI and SRI sampling events, a total of four sediment samples were collected from the Rockaway River from a depth of 0 to 6 inches below the stream bed.

Two sediment samples were collected from areas of the river immediately downstream from the spillway of the Washington Forge Pond. These samples were collected from areas of the river thought to be hydraulically upgradient of possible surface water discharges from the source areas at the L.E. Carpenter site. Five sediment samples were collected from areas of the river immediately adjacent to and downgradient (downstream) of the L.E. Carpenter site. Samples were collected using a stainless steel, decontaminated bucket auger. SS-10R was collected at the same location as SS-10, which was collected during the SRI.

A sampling depth of 2 to 3 feet below the top of the sediments was attempted at all locations; however, the presence of cobbles and gravel within deeper portions of the sediment caused auger refusal at all locations. The five downgradient samples were collected from a depth of 1.5 to 2 feet below the top of the sediments, while the two upgradient samples were collected from a depth of 0 to 6 inches. Refusal was encountered two to three times at each location prior to sample collection.

Four of the five downgradient samples and the two upgradient samples collected were analyzed for total organic carbon (TOC), target compound list base neutrals plus ten semi-volatiles (BN+10), antimony, copper, lead, mercury, and grain size. The remaining downgradient sample (SS-10R) was analyzed for PCBs and BN+10. Table 2-1 provides a summary of sediment sampling activities that occurred on 8 April 1991.

One field blank was collected during sampling activities and was analyzed for TOC, BN+10, antimony, copper, lead, and mercury.

2.5 Monitoring Well Installation

At the request of the NJDEPE, five additional groundwater monitoring wells (MW-21 through MW-25) were installed on the Wharton Enterprises and Air Products properties during 1991 and 1992. These wells were installed for two primary objectives; to further define the extent of contamination originating from the site and to determine shallow groundwater flow direction on

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TABLE 2-1

SUPPLEMENTAL SEDIMENT SAMPLING IN THE ROCKAWAY RIVER
L.E. CARPENTER FACILITY
WHARTON, NEW JERSEY

SAMPLE	LOCATION	DEPTH COLLECTED (feet)	PARAMETERS ANALYZED
SS-2-1	Downgradient	1.5-2.0	TOC, BN+10, antimony, copper, lead, mercury, GS
SS-2-2	Downgradient	1.5-2.0	TOC, BN+10, antimony, copper, lead, mercury, GS
SS-2-3	Downgradient	1.5-2.0	TOC, BN+10, antimony, copper, lead, mercury, GS
SS-2-4	Upgradient	0.0-0.5	TOC, BN+10, antimony, copper, lead, mercury, GS
SS-2-5	Upgradient	0.0-0.5	TOC, BN+10, antimony, copper, lead, mercury, GS
SS-2-6	Downgradient	1.5-2.0	TOC, BN+10, antimony, copper, lead, mercury, GS
SS-10R	Downgradient	1.5-2.0	PCB, BN+10

TOC = Total Organic Carbon
BN+10 = Base Neutrals plus Ten Semivolatiles
GS = Grain Size

the Wharton Enterprises and Air Products properties. All wells were installed using the air hammer drilling technique and were constructed of stainless steel screens and riser casings.

The well depths ranged from 6 to 15 feet below ground surface (BGS). Table 2-2 presents a summary of the well construction details for the five wells. Well completion and geologic logs are provided in Appendix A.

In addition, due to concerns regarding the integrity of MW-14S located on the Wharton Enterprises property, NJDEPE requested that a hydraulic test be conducted in order to determine if the well was in hydraulic communication with the shallow aquifer zone. The hydraulic test plan called for adding potable water to the well and observing the subsequent water level changes. The test was conducted on 20 May 1991. The depth-to-water from the top of the internal casing was found to be 3.5 feet prior to testing. Potable water was used to fill the internal casing to the top. Once the casing was filled and the potable water supply was shut off, the water in the well returned to the static water level within approximately 20 seconds. No leakage from the internal casing or around the base of the external protective casing was observed. The test was repeated four times in order to confirm these observations. The results were similar for each repetition. These observations indicated that the potable water was flowing directly into the formation via the well screen and that the well was in hydraulic communication with the formation.

Three monitoring wells (MW-21, MW-22, and MW-25) were installed on the Wharton Enterprises property at the locations indicated in Figure 2-1. These wells were positioned in order to further define the extent of dissolved and/or free floating organic compounds and define the direction of shallow groundwater flow on the Wharton Enterprises property.

MW-21 was installed on 22 May 1991. Split spoon samples were collected over the entire length of the borehole and were screened with a PID. All PID readings and geologic observations were recorded on the field geologic log. PID screening measurements were consistently at background levels. A yellow/brown to gray, stiff clay was observed at location MW-21 from the ground surface to a depth of 11 feet BGS. All split spoon samples collected from the clay layer were dry, as was the borehole over the 0 to 11 foot BGS interval. At a depth of 11 feet BGS, a brown, well-sorted fine grained sand was encountered.

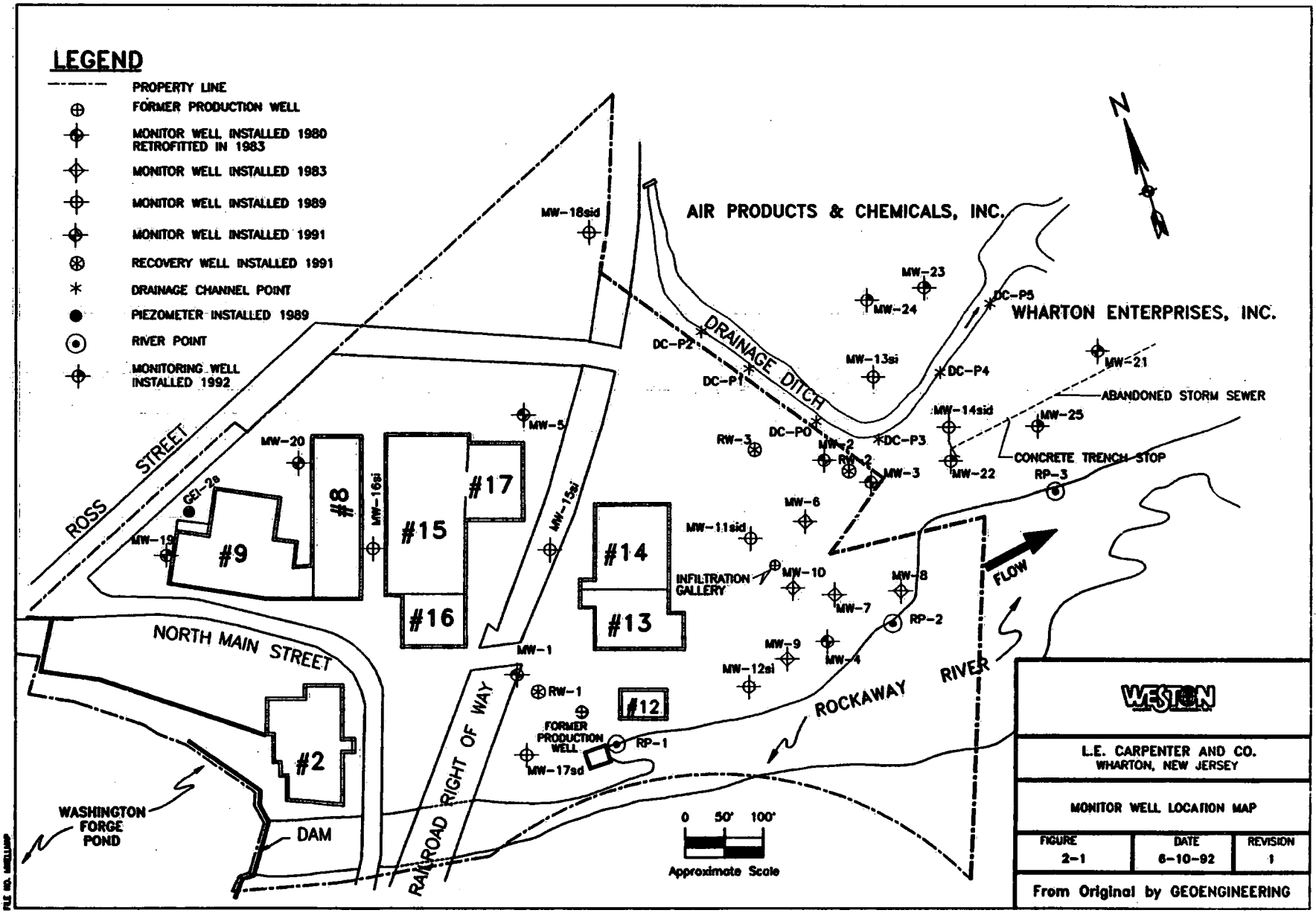
Upon breaching this formation, groundwater entered the borehole and rose to a height of 6 feet BGS. The screen for this well was positioned so that the upper portion of the screen was across the static water level (i.e., 6 feet BGS) and the lower portion of the screen was within the water entry zone (i.e., 11 to 15 feet BGS).

MW-22 was installed on 3 January 1992. The shallow deposits (0 to 4 feet BGS) at location MW-22 consisted of a clayey silt. No standing water was observed in the borehole and PID readings were at background over the 0 to 4 feet interval. The split spoon sample collected from the 2 to 4 feet BGS interval was moist and contained a slight odor. A gray clay was

TABLE 2-2

SUMMARY OF WELL CONSTRUCTION DETAILS
FOR MW-21 THROUGH MW-25
L.E. CARPENTER SITE, WHARTON, NEW JERSEY

Well No.	Permit No.	Date Installed	Surface Casing Type	Total Depth (ft)	Screened Interval (ft)	Depth to Water from Top of Casing (ft.)
MW-21	2538805	5/22/91	Stickup	15.0	5.0-15.0	6.00
MW-22	2539766	1/03/92	Stickup	11.0	1.0-11.0	4.72
MW-23	2539767	1/06/92	Stickup	6.0	1.0-6.0	3.35
MW-24	2539768	1/07/92	Flushmount	7.0	2.0-5.0	2.94
MW-25	2540451	2/05/92	Stickup	11.0	1.0-11.0	2.00


LEGEND
PROPERTY LINE
FORMER PRODUCTION WELL
MONITOR WELL INSTALLED 1980 RETROFITTED IN 1983
MONITOR WELL INSTALLED 1983
MONITOR WELL INSTALLED 1989
MONITOR WELL INSTALLED 1991
RECOVERY WELL INSTALLED 1991
DRAINAGE CHANNEL POINT
PIEZOMETER INSTALLED 1989
RIVER POINT
MONITORING WELL INSTALLED 1992
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
N
ROSS STREET
NORTH MAIN STREET
DRAINAGE DITCH
ABANDONED STORM SEWER
CONCRETE TRENCH STOP
INFILTRATION GALLERY
FLOW
ROCKAWAY RIVER
RAILROAD RIGHT OF WAY
WASHINGTON FORGE POND
DAM
FORMER PRODUCTION WELL
#2
#8
#9
#12
#13
#14
#15
#16
#17
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10
MW-11sid
MW-12si
MW-13si
MW-14sid
MW-15si
MW-16si
MW-17sd
MW-18sid
MW-19
MW-20
MW-21
MW-22
MW-23
MW-24
MW-25
RW-1
RW-2
RW-3
RP-1
RP-2
RP-3
DC-P0
DC-P1
DC-P2
DC-P3
DC-P4
DC-P5
GZI-2*
0 50' 100'
Approximate Scale
WESTON
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
MONITOR WELL LOCATION MAP
FIGURE 2-1
DATE 6-10-92
REVISION 1
From Original by GEOENGINEERING

encountered at a depth interval of 4 to 6 feet BGS. PID readings from this clay were at background levels. A sandy water bearing zone was encountered below the clay. Once this zone was penetrated, the standing water in the borehole rose to approximately 4.5 feet BGS. The screen was installed from one 1 to 11 feet BGS.

A soil gas survey was conducted on 7 January 1992 to provide information for the proper placement of MW-25. Soil gas sampling stations were established at 30 foot intervals along a line extending northeast from MW-22 (see Plate 3). At each station, a monitoring point was advanced using a hand held slam-bar to depth of approximately 3.5 feet BGS. A vented stainless steel tube was then inserted into the borehole. Modeling clay was molded around the tube so as to form a tight seal at the surface. The stainless steel tube was then connected to a PID via flexible teflon tubing and the PID readings were recorded in a field logbook. A total of ten (10) soil gas locations were sampled. The associated PID readings are presented in Table 2-3. Eight of the ten samples (SG-003 through SG-010) were consistent with background conditions (0 units). Two samples (SG-001 and SG-002) yielded responses above background at 50 and 7 units, respectively. These sample locations were immediately northeast of MW-22. Monitoring well MW-25 was installed northeast of sample location SG-004 in an attempt to position the well outside of the dissolved organic compound plume.

MW-25 was installed on 5 February 1992. A gray/yellow clay was encountered from the ground surface to a depth of 8 feet BGS. Water was encountered in the sand unit underlying this clay. Once this sand unit was penetrated, the water rose to a level of 2 feet BGS. PID readings were at background levels over the entire length of the borehole. The screen for this well was installed over the 1 to 11 feet BGS depth interval.

Two monitoring wells (MW-23 and MW-24) were installed on the Air Products property at the locations indicated in Figure 2-1. These wells were positioned relative to the existing well MW-13S in order to determine shallow groundwater flow on the Air Products property. They were used to collect groundwater samples which would provide further information concerning the possible origin of the volatile organic contamination previously detected in MW-13S.

Wells MW-23 and MW-24 were installed on 6 and 7 January 1992, respectively. The ground surface on the Air Products property consisted of coarse crushed stone. The shallow deposits at MW-23 and MW-24 consisted of coarse to fine sand with some silt and gravel. These deposits were saturated.

A dry, gray clay was encountered at a depth interval of 7.5 to 10 feet BGS at MW-23. In order to eliminate any potential for cross-contamination between the shallow water-bearing zone and deeper zones and in order to monitor for potential low density dissolved phase organics, the screen for this well was installed over the 1 to 6 feet BGS depth interval. PID readings from split-spoon samples collected over this interval were 1 to 2 units above background levels.

Although a similar clay unit was observed at MW-24, it was only three inches thick and was

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TABLE 2-3

SUMMARY OF SOIL GAS PID OBSERVATIONS MADE ON 7 JANUARY 1992, L.E. CARPENTER SITE, WHARTON, NEW JERSEY

Sampling Location	Sampling Depth (ft. BGS)	PID Reading (units above background*)
SG-001	5.0	50
SG-002	5.0	7
SG-003	5.0	0
SG-004	5.0	0
SG-005	5.0	0
SG-006	5.0	0
SG-007	5.0	0
SG-008	5.0	0
SG-009	5.0	0
SG-0010	5.0	0

* PID unit calibrated using 51 ppm isobutylene calibration gas. Span setting = 10.10, 51 ppm isobutylene = 56 units.

found to be completely saturated. PID readings from split-spoons collected over the entire length of the borehole were at background levels. The screen for this well was installed above this clay over the 2 to 7 foot BGS interval.

Geologic cross-sections depicting these subsurface features are presented in Section 3.5 of this report.

2.6 Groundwater Sampling

Sampling of the new monitoring wells (MW-21 through MW-25) as well as the existing wells on the Air Products property (MW-13S and MW-13I) was accomplished in two sampling rounds, hereafter referred to as Rounds 3 and 4. The Round 3 sampling effort occurred between 3 July and 9 July 1991 and included wells MW-21, MW-13S, and MW-13I. Round 4 sampling occurred on 19 February 1992 and included wells MW-22 through MW-25. A summary of the analytical parameters for these two rounds is provided in Table 2-4.

To obtain a representative sample, a decontaminated submersible pump was used to purge approximately three (3) well volumes of water for each well. The decontamination procedure was as follows:

- non-phosphate detergent scrub
- tap water rinse
- deionized water rinse
- 10% nitric acid solution rinse
- deionized water rinse
- acetone rinse
- air-dry
- deionized water rinse

All samples were collected using laboratory decontaminated bailers. One field rinsate blank per analytical parameter was included in each sample shipment. The field rinsate blank was handled, transported, and analyzed in the same manner as samples collected in the field that day. The field blank was collected by passing analyte-free water over a clean sampling device (bailer) into an empty sample container. One trip blank for VOC analysis was included in each sample batch. All trip blanks were handled and transported in the same manner as the VOC samples collected that day. All samples and blanks were shipped to the laboratory via overnight courier. The analytical results are presented and discussed in Section 4.3.

2.7 Off-Site Groundwater Usage

In response to a request from NJDEPE for additional information regarding local groundwater usage, a comprehensive search for wells located within one mile of the L.E. Carpenter site was completed in order to characterize possible groundwater usage in the immediate area. The well search consisted of the following: NJDEPE well permit search; a review of records at local

TABLE 2-4

SUMMARY OF ANALYTICAL PARAMETERS FOR GROUNDWATER SAMPLES COLLECTED IN JULY 1991 AND FEBRUARY 1992 L.E. CARPENTER SITE, WHARTON, NEW JERSEY

	MW-13i		MW-13s		MW-21		MW-22	MW-23	MW-24	MW-25
PARAMETER	ROUND 3	ROUND 4	ROUND 3	ROUND 4	ROUND 3	ROUND 4	ROUND 4	ROUND 4	ROUND 4	ROUND 4
(Sample Date)	(2/19/91)	(2/19/91)	(7/9/91)	(2/19/92)	(7/3/91)	(2/19/92)	(2/19/92)	(2/19/92)	(2/19/92)	(2/19/92)
TCL - VOC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TCL - BN	✓		✓		✓		✓	✓	✓	✓
TAL METALS	✓		✓		✓		✓	✓	✓	✓
PESTICIDES-PCBs	✓		✓		✓		✓	✓	✓	✓

TCL = Target Compound List
VOC = Volatile Organic Compound
BN = Base Neutral Compound

tax offices, water and health departments; telephone correspondence with potential well owners, when possible; questionnaire mailing to owners of potentially active wells not reached by telephone; and site visits to those well locations where records indicated that they were potentially downgradient of the L.E. Carpenter facility and potentially in use.

The well search identified 25 well permits within one mile of the L.E. Carpenter site that were classified as public supply wells, irrigation wells, or domestic wells. Well locations were plotted using the NJDEPE LORDS Coordinate System, and where possible, exact locations were verified through comparison with street addresses of the well owners listed on the well search information. Locations of wells within one mile of the L.E. Carpenter site can be found in Figure 2-2. Table 2-5 summarizes information retrieved for the 25 wells located within one mile of the L.E. Carpenter site.

Of particular concern are those wells located directly downgradient of the L.E. Carpenter site. As discussed in Section 3.4.2, organic compounds have primarily affected the shallow aquifer zone at the L.E. Carpenter site. Therefore, wells screened in the deep aquifer zone or the fractured bedrock aquifer are not potential receptors. At shallower depths, the regional direction of groundwater base flow mimics that of the surface water (i.e., the Rockaway River) flow direction. The potential downgradient receptors are those wells screened at depths less than 50 feet BGS within the glacial/alluvial outwash deposits to the east and southeast of the site. This area is depicted graphically in Figure 2-2 by the use of shading.

Well numbers 9 and 25 (see Table 2-5) are potential downgradient receptors. Well number 9 is listed as the Borough of Wharton Public Supply Well #3. Well #25 is owned by Shamrock Oil Company which is no longer in business. The Shamrock well is not in use.

One of the 25 wells could not be located. Well #1 is listed as being owned by Mr. John Ballard on the NJDEPE well permit record and was constructed in 1960. No address or other pertinent information was supplied by the NJDEPE Bureau of Water Allocation in reference to the Ballard well. Several field surveys in the area and interviews with local residents did not yield information concerning the status or location of the well. No telephone listing for a Ballard was available in this area.

It is apparent that the former Ballard property has changed owners. Representatives from the tax assessors' offices for the Towns of Wharton and Roxbury that were contacted by WESTON could not locate John Ballard or provide present or past tax records.

The well owned by Mr. Samuel Mooney is located approximately 1/4 mile southwest of L.E. Carpenter and is not within the area estimated to be hydraulically downgradient. Furthermore, Wharton Water Department officials confirmed that the immediate area where the former Mooney residence was located is serviced entirely by public water.

Source: USGS Dover, NJ Quadrangle

FIGURE 2-2

KEY

① Well location

Scale 1:24,000

Area downgradient from the L.E. Carpenter site.

Map showing wells within a one mile radius of the L.E. Carpenter site, Wharton, NJ.

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filename:wellsscr.drw

TABLE 2-5
SUMMARY OF WELL LOCATIONS WITHIN ONE MILE OF L.E. CARPENTER AND COMPANY
WHARTON, NEW JERSEY

Map ID	Well I.D.	Owner Address	Permit #	USE	Date Constructed	Status/Comments
1	Ballard, John	Roxbury Township, NJ 07885	25-9608	D	11/27/60	Not located
2	Bird, John	2845 W. Dewey Ave., Wharton, NJ 07885	25-16185	D	11/29/71	In use
3	Casey, Julia	296 W. Dewey Ave., Wharton, NJ 07885	25-16470	D	07/03/72	In use
4	Casey, Julia	296 W. Dewey Ave., Wharton, NJ 07885	25-21618	D	09/26/80	Well dry, not in use
5	Townsquare Nursery	420 Rte. 15, Dover, NJ 07801	25-24993	I	05/21/85	Not in use/on public water
6	Galantino, William	2 Lewis St., Wharton, NJ 07883	25-29370	D	09/15/88	In use
7	Townsquare Village	1325 Morris Ave., Union, NJ 07885	25-32121	I	09/15/88	On public water
8	Townsquare Village	1325 Morris Ave., Union, NJ 07885	25-32122	I	09/19/88	On public wter
9	Wharton Well #3	Princeton Avenue, NJ 07801	25-16024	P	04/01/66	In use, acceptable water quality
10	Mooney, Samuel	Roxbury Township 07885	25-6669	D	06/22/57	On public water
11	Katermann, William	Mt. Fern, Dover, NJ 07801	25-7581	D	04/14/58	On public water
12	Knutsen, Arthur	16 Maple Terr., Wharton, NJ 07885	25-10074	D	08/17/61	On public water
13	Borough of Wharton	10 Roberts St., Wharton, NJ 07885	25-2178	P	09/08/53	Not in use, TCE contaminated
14	Borough of Wharton	10 Roberts St., Wharton, NJ 07885	25-8675	P	12/21/60	Not in use, TCE contaminated

Highlighted properties are potentially downgradient of the LEC site.
D = Domestic
I = Irrigation
P = Public Supply

TABLE 2-5
(CONT'D)
SUMMARY OF WELL LOCATIONS WITHIN ONE MILE OF L.E. CARPENTER AND COMPANY
WHARTON, NEW JERSEY

Map ID	Well I.D.	Owner Address	Permit #	USE	Date Constructed	Status/Comments
15	Csohla, John	Box 534 Union Tpk., Wharton, NJ 07885	25-18454	D	06/02/76	In use
16	Dakos, Joseph	325 Union Tpk., Wharton, NJ 07885	25-10846	D	09/13/62	On public water
17	Highland of Morris	160 Littleton Road, Parsippany, NJ	25-29036	D	08/12/87	Well present, property undeveloped, not in use
18	Foxcraft Motors	Rt. 15, Wharton, NJ 07885	25-13996	D	09/09/66	No longer in business
19	Szpilosy, Ludwig	Richard Mine Road, Wharton, NJ 07885	25-11728	D	12/21/63	On public water
20	Samuels and Sons	P.O. Box 623, Morristown, NJ	25-10078	D	07/25/61	No longer in business
21	Garie, Joseph	Wharton, NJ 07885	25-3681	D	10/01/59	In use
22	Donnelly, William	89 W. Central St., Wharton, NJ 07885	25-9905	D	04/12/61	Not in use/on public water
23	Rizzo, Phillip	446 Morris Ave., Springfield, NJ	25-15748	D	12/04/70	Well closed 1971, on public water
24	Lamant, Jack	97 Cayoga Ave., Rockaway, NJ 07885	25-15430	D	12/11/69	Well not in use, on public water
25	Shamrock Oil Company	Rte. 15, Wharton, NJ 07885	25-9366	D	06/21/66	Out of business, well not in use

Highlighted properties are potentially downgradient of the LEC site.
D = Domestic
I = Irrigation
P = Public Supply

The Wharton Water Department was also contacted for additional information relative to water supply wells. The Department indicated that they knew of only two private wells within Wharton and they were not within a one mile radius of the L.E. Carpenter site.

As discussed in Sections 4.3.1 and 4.3.2, the areal extent of dissolved and immiscible organic compounds in the groundwater at the site is fully defined by the existing site monitoring wells. There is no evidence to indicate that these compounds have migrated or can possibly migrate beyond the existing site monitoring well system. Therefore, it is very unlikely that the two potential receptors identified above would be impacted by organic compounds emanating from the L.E. Carpenter site.

2.8 Storm Sewer Pipeline Investigation

In order to further investigate the potential for contaminant transport along the bed of the abandoned Rockaway Valley Regional Sewer Authority (RVRSA) storm sewer line (see Figure 2-1), WESTON met with Mr. Ed Ho of RVRSA on 29 August 1991 at the L.E. Carpenter site. A construction plan was provided to WESTON (see Plate 2). Mr. Ho informed WESTON that to mark out the line the contractor planted trees on either side of the easement. Field observations of the alignment of these trees indicated that the location of the abandoned line, as shown on the WESTON well location map (see Figure 2-1) and on Plate 2, is accurate. According to Mr. Ho, the storm sewer installation project followed the construction plan to the end-point shown in Figure 2-1, where evidence of contamination was encountered. Construction was halted at that point.

On 2 October 1991, WESTON contacted the construction contractor, R.J. Longo, Inc., to gain further information on the closure procedures. Mr. Phil Liberti, the construction supervisor for the project, pointed out that on either side of the drainage ditch and at specific points along the sewer line, concrete trench stops were installed normal to the axis of the trench. The trench stops were installed such that the cement slurry fully encompassed the pipe and completely filled the trench, thus, providing a competent barrier prohibiting groundwater flow along the outside of the pipe or through the pipeline bedding. Plate 2 shows that one such trench stop was installed approximately 80 feet east of the pipeline terminus. This location is also shown on the site map. According to Mr. Liberti, the pipe was sealed with a steel end cap and was left in place.

Section 4.3.2 presents a discussion of soil gas data, groundwater data, sewer line as-built construction details and the field hydraulic observations which indicate that no significant flow of organics has occurred along with the abandoned pipeline.

2.9 Disposal Area Investigation

During completion of a shallow excavation for the installation of underground piping for the EPIRS in October 1991, remains of several 55-gallon drums were uncovered. In addition, two areas were identified as potential fill areas by the NJDEPE during evaluation of historical aerial photographs. A series of exploratory trenches were planned in order to delineate the extent of possible disposal areas as well as to locate subsurface drums identified during the EIPRS trenching operations. WESTON excavated nine exploratory test pits from 27 January to 29 January 1992. Two samples were collected from the materials exposed during trenching operations. Results of the investigation are presented in Section 3.6.

WESTON MANAGERS DESIGNERS/CONSULTANTS

SECTION 3.0

PHYSICAL CHARACTERISTICS OF THE SITE

3.1 Flood Plain Delineation

The areal extent of the 100- and 500-year flood plains are depicted in Plate 1. The design of the Washington Forge Pond dam is such that blockage of the spillway would result in spillage over the section of the dam north of the water tower along Main Street. In that event, much of the area north of the Central Railroad Right-of-Way (railroad ROW) would lie within both the 100- and 500-year flood plains. This area is labeled Area A on Plate 1. The topographically elevated bed of the railroad ROW would form a barrier prohibiting floodwater from entering the area labeled Area B on Plate 1. Since most of Area B is topographically elevated compared to the Rockaway River bed, this area would be unaffected by floodwater emanating from the main channel of the river. Therefore, most of Area B lies outside the 100- and 500-year flood plains. Only the eastern perimeter of this area (i.e., the strip along the Wharton Enterprises property boundary and along the Air Products drainage ditch) lies within both the 100- and 500- year flood plains. The Wharton Enterprises portion of the site lies within both the 100- and 500- year flood plains.

3.2 Cultural Resource Survey

File searches and literature reviews did not identify the presence of prehistoric sites within one mile of the project area. The Stage IA CRS indicated that the L.E. Carpenter property possesses a moderate potential to contain archeological resources at soil depths below those previously disturbed (fill areas) on-site. Based upon observations made during soil borings, the area southeast of the railroad ROW is thought to contain an extensive amount of fill generally within the upper five feet. The area of the site northwest of the ROW is thought to have been disturbed and filled within the upper two feet. For that reason, the CRS recommended that a Stage IB survey may only be necessary if remediation activities or disturbance is planned for soil depths below that which has been previously disturbed. The area of the site southeast of the ROW was utilized as a fill area for mining spoils when the property was used for mining operations.

The Stage IA survey also determined that Building 2, the former Ross and Baker Silk Mill located to the south and west of North Main Street, has considerable potential to constitute a significant historical archeological resource. Therefore, should Building 2 be affected by the chosen remedial alternative, the CRS suggests that it be the subject of a detailed historic and archeological Stage II evaluation for its potential to provide significant data regarding the development of the silk industry in New Jersey.

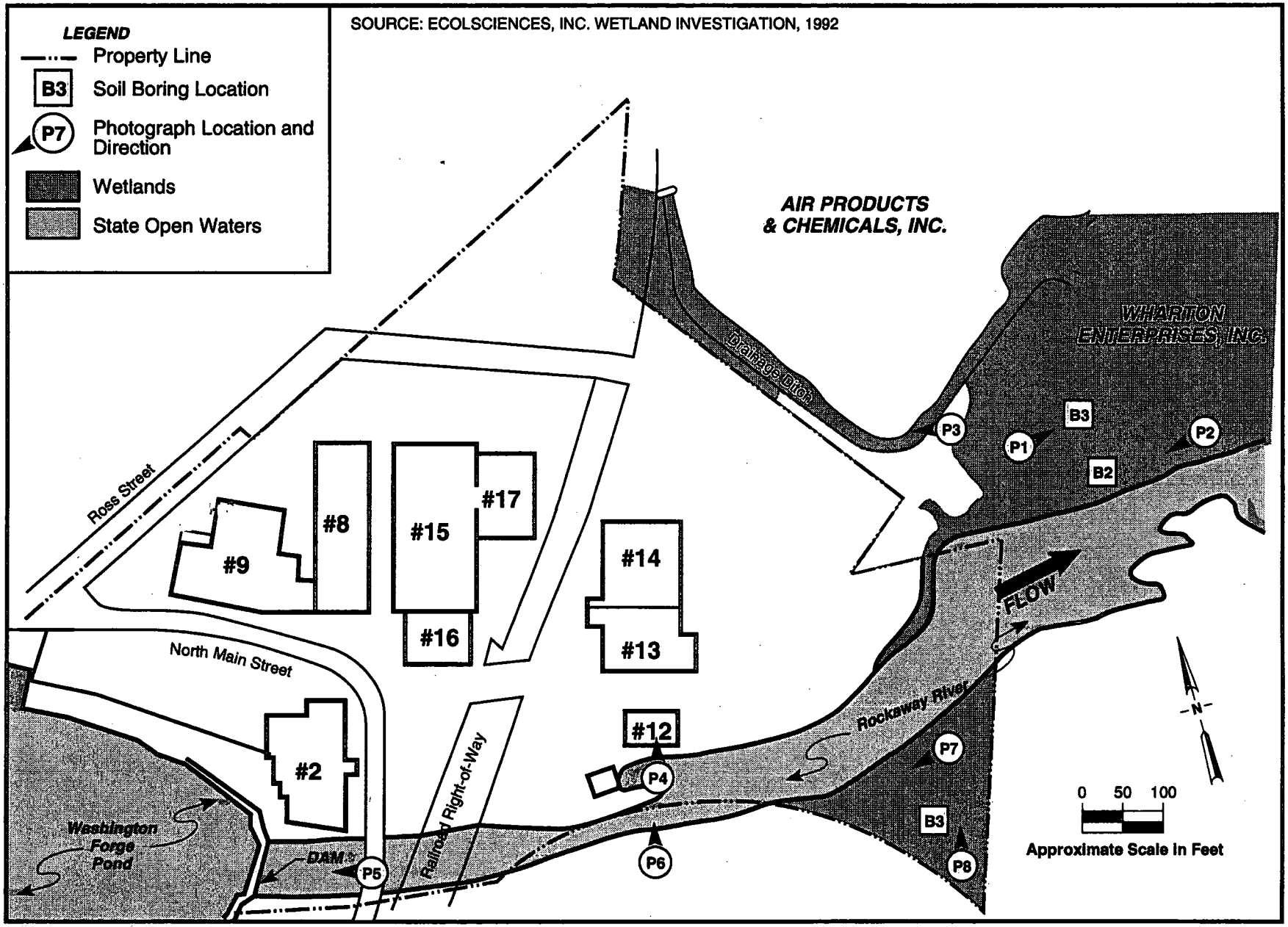
The complete Stage 1A CRS Report is contained in Appendix B to this report.

3.3 Wetlands Survey

The Wetlands Survey indicated the presence of wetlands at the L.E. Carpenter facility. Approximate locations of wetlands on-site and on adjacent Air Products and Wharton Enterprises properties are presented in Figure 3-1 duplicated from the Wetlands Assessment Report. On-site wetlands appear to be limited to a narrow strip adjacent to Washington Forge Pond on the southwest border of the property; a strip adjacent to the Rockaway River on the southeast border of the property; and a small area in the vicinity of the penstock outfall.

A more extensive wetlands area was identified on Air Products property which is associated with the drainage ditch on its western leg. This area extends northwest to the common property boundary of Air Products and L.E. Carpenter. Wetlands were also identified extending from the northeast leg of the drainage ditch through Wharton Enterprises property to the Rockaway River. These wetlands would be considered of ordinary resource value; however, according to the "EPA Priority Wetlands for the State of New Jersey," all wetlands within the Passaic River Basin are considered priority wetlands. Furthermore, wetlands delineated in the project area are subject to transition areas which are to be based on determination by NJDEPE of the resource value of the wetlands. Prior to the assessments, the United States Department of the Interior Fish and Wildlife Service (DOI), through NJDEPE, recommended that a survey for the federally threatened plant species *Helonias bullata* (swamp pink) be conducted. No other plant species was specified by the U.S. DOI. The DOI also states that, with the exception of an occasional transient Bald Eagle (*Haliaeetus leucocephalus*) or Peregrine Falcon (*Falco peregrinus*), no other federally listed or proposed threatened or endangered flora or fauna are known to occur in the study area. During the field reconnaissance, no evidence of swamp pink was observed. Furthermore, there were no endangered or threatened plant or animal species observed within on-site or adjacent wetlands.

The wetlands assessment evaluated the social significance, effectiveness, and opportunity of several wetlands functions, which are then ranked low, moderate, or high. A tabular summary of this evaluation is included in the assessment report and highlights are presented below. All wetland functions evaluated were characterized by low to moderate social significance scores, which generally conforms to what could be expected from wetlands abutting a river while surrounded by extensive and historical industrial development. The effectiveness of the delineated wetlands to perform the functions of groundwater discharge and nutrient removal/transformation were judged to be high, whereas the effectiveness of all other evaluated functions ranged between low and moderate. Three wetlands functions were evaluated as having high opportunity: sediment/toxicant retention, nutrient removal/transformation, and flood flow alteration.



947-8262

FIGURE 3-1 APPROXIMATE WETLANDS LOCATION MAP, L.E. CARPENTER SITE, WHARTON, NJ

Wetlands functions of wildlife diversity/abundance, breeding, migration, wintering, aquatic diversity/abundance, uniqueness/heritage and recreation were all judged to have low social significance or effectiveness. This coupled with the lack of evidence of endangered or threatened flora/fauna would support the recommended classification of these wetlands as being of ordinary resource value.

The complete Wetlands Assessment Report is contained in Appendix C to this report.

3.4 Regional Geology and Hydrogeology

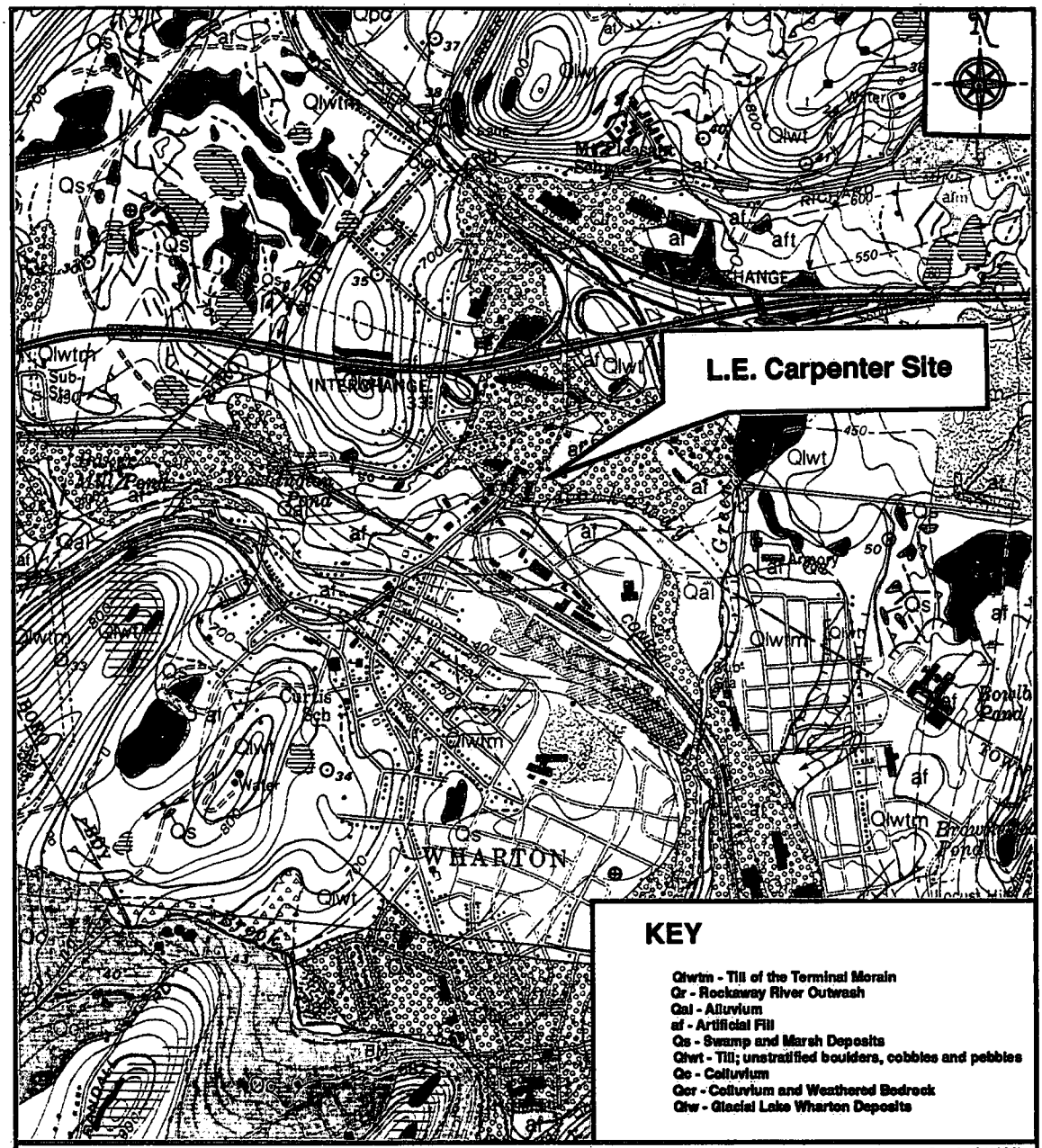
3.4.1 Regional Geology

The site is located in the Highlands Physiographic Province. The area is characterized by northeastward trending ridges and valleys with typically 200 to 300 feet of relief between the two. The terminal moraine of the Wisconsin Glacial Stage passes through the area surrounding the site (see Figure 3-2). The alluvial outwash material from this moraine occupies many of the valley floors in the area.

The L.E. Carpenter site is located within the Dover 7.5 minute topographic quadrangle. The surficial deposits of this quadrangle have been mapped and described in detail by Stanford (1989). The regional geologic setting for the site is depicted in Figure 3-2. The sediments of the Rockaway River Valley contain the deposits of two Wisconsin age glacial advances. Meltwater from the initial glacial advance deposited medium grained sands known as the Pre-Late Wisconsin age stratified drift deposits (Qplwg). During the second glacial advance, thick deposits of terminal moraine material were laid down throughout the area (see deposits labeled Qlwtm, Figure 3-2). This material was subsequently washed out of the glacial valleys. It is still present at the higher elevations. Meltwater from the retreating glacier deposited glacial outwash in the channels of the Rockaway River. Following the cessation of the meltwater deposition, post-glacial alluvium began to accumulate along the Rockaway River Valley and the lower reaches of its tributaries. These deposits are labeled "Qal" in Figure 3-2.

3.4.2 Regional Hydrogeology

The regional hydrogeology has been described by Stanford and Ashley (1992). The surficial unconsolidated deposits described in Section 3.4.1 form glacial/alluvial outwash aquifers in the Rockaway River Valley. These are by far the most prolific aquifers in the region. In the vicinity of the L.E. Carpenter site, they occupy the Rockaway River Valley and extend from the area west of Washington Pond eastward beneath the L.E. Carpenter site to the confluence with Green Pond Brook where the deposits shift southward along the eastern border of the Town of Wharton (see Figures 1-1 and 3-2). Yields for wells screened within these aquifers are generally several orders-of-magnitude greater than those screened within the adjacent and underlying fractured bedrock aquifers. According to Stanford and Ashley (1992), groundwater flow in these aquifers generally mimics the surface water (i.e., the Rockaway River) flow direction.



WESTON
MANAGERS DESIGNERS/CONSULTANTS

L.E. CARPENTER SITE
WHARTON, NJ.

FIGURE 3-2
REGIONAL GEOLOGIC MAP

Organic compounds have only affected the shallow and intermediate depth (i.e., less than 50 feet BGS) aquifer zones at the L.E. Carpenter site. Therefore, wells screened in deep aquifer zone or in the fractured bedrock aquifer are not potential receptors. The only potential receptors are those wells screened within the shallow and intermediate zones of the glacial/alluvial outwash aquifers of the Rockaway River Valley to the east and southeast of the site.

3.5 Site Specific Geology and Hydrogeology

3.5.1 Site Geology

3.5.1.1 Site Soils

An aerial photograph depicting soil types in the vicinity of the L.E. Carpenter site is presented in Figure 3-3. The surface soils in the Rockaway River glacial outwash valley are classified as the Riverhead-Urban Land-Pompton Association. These soils are described in United States Department of Agriculture (USDOA, 1976) as deep, well-drained to somewhat poorly-drained, nearly level to strongly sloping gravelly sandy loams, and sandy loams that overlie stratified outwash sand and gravel on outwash plains and terraces. Most of the surface soils at the site have been disturbed by previous mining activities as well as by landscaping activities carried out during the construction of the L.E. Carpenter facility and the adjacent Air Products facility. These soils are mapped as Ua - Urban land. They are mostly well-drained, deep sandy, gravelly, or stony material of assorted glacial deposits (USDOA, 1976). Included in this unit are small undisturbed areas of Rockaway, Hibernia, Riverhead, and Boonton soils (USDOA, 1976).

The surface soils on the southeastern portion of the L.E. Carpenter property and much of the Wharton Enterprises property, are classified as Wm - Whitman very stony loam. This soil has a high content of organic matter in the surface layer, contains stones and boulders throughout, and has slow permeability (USDOA, 1976). The Hibernia stony loam (HbC) occupies portions of the Wharton Enterprises property and the Air Products property (see Figure 3-3). Although the ground surface on these properties is generally flat, this soil unit is capable of maintaining slopes of up to 15 percent. It features stones and boulders throughout the profile, slow permeability, and moderate to rapid runoff.

The northeastern portion of the L.E. Carpenter property and the northern portion of the Air Products property is occupied by the Ridgebury very stony loam (RgA, see Figure 3-3). The subsoil and generally the surface layers of this unit are as much as 50 percent stones, cobbles, and gravel. It is usually found in low lying areas, such as the former starch drying bed area of the L.E. Carpenter site. It is poorly drained and features moderate to slow permeability (USDOA, 1976).

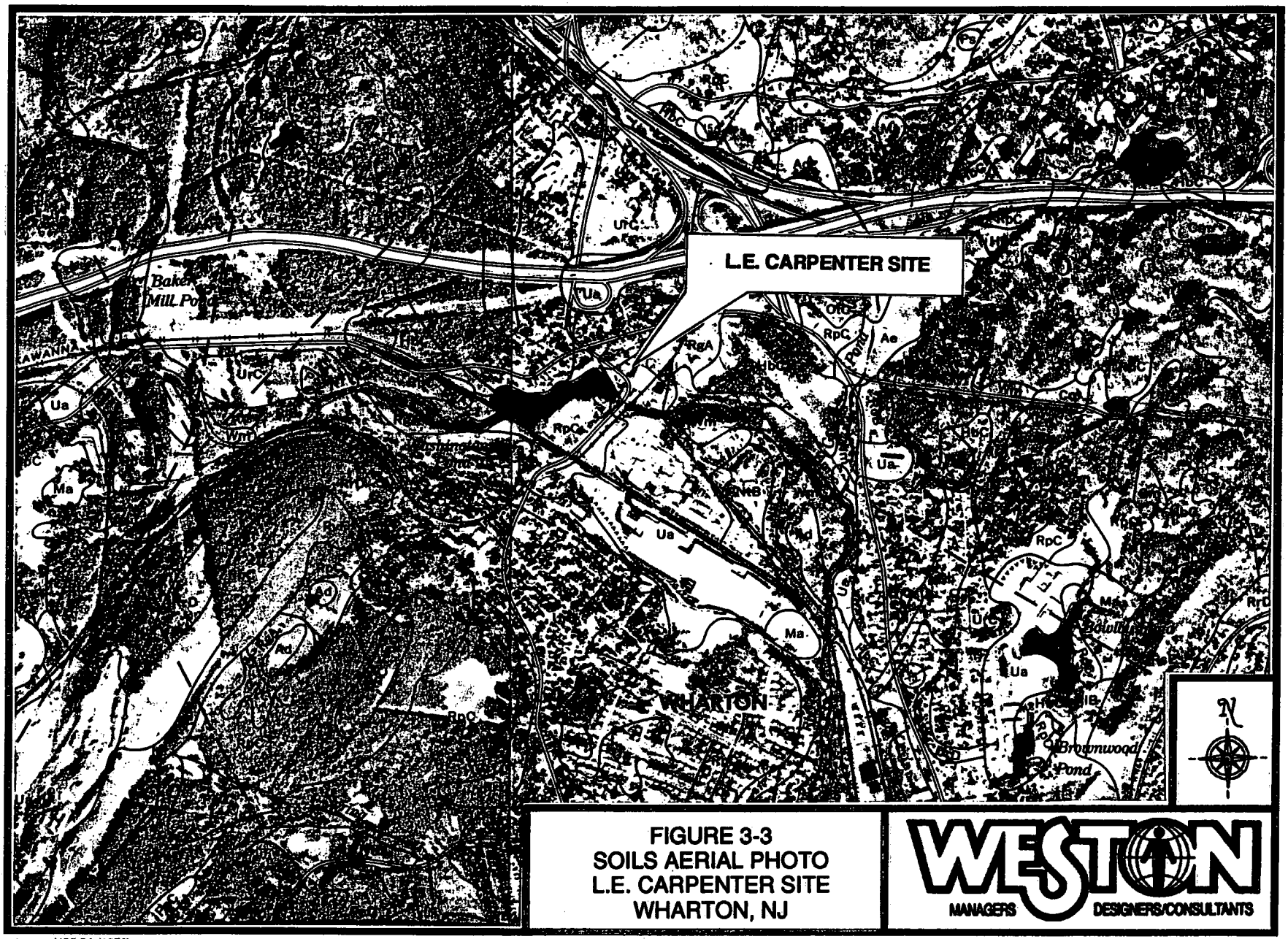


FIGURE 3-3
SOILS AERIAL PHOTO
L.E. CARPENTER SITE
WHARTON, NJ

WESTON
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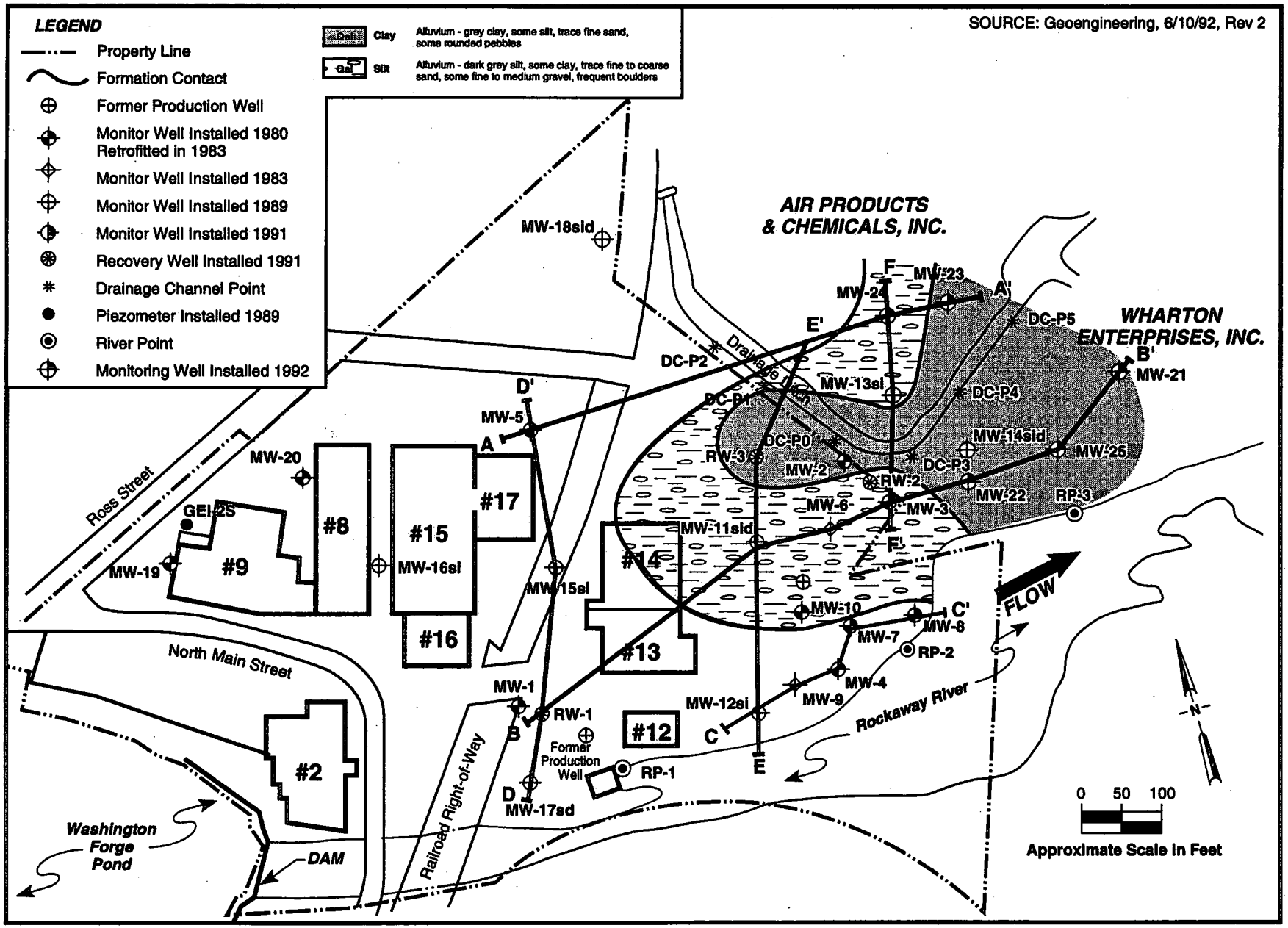
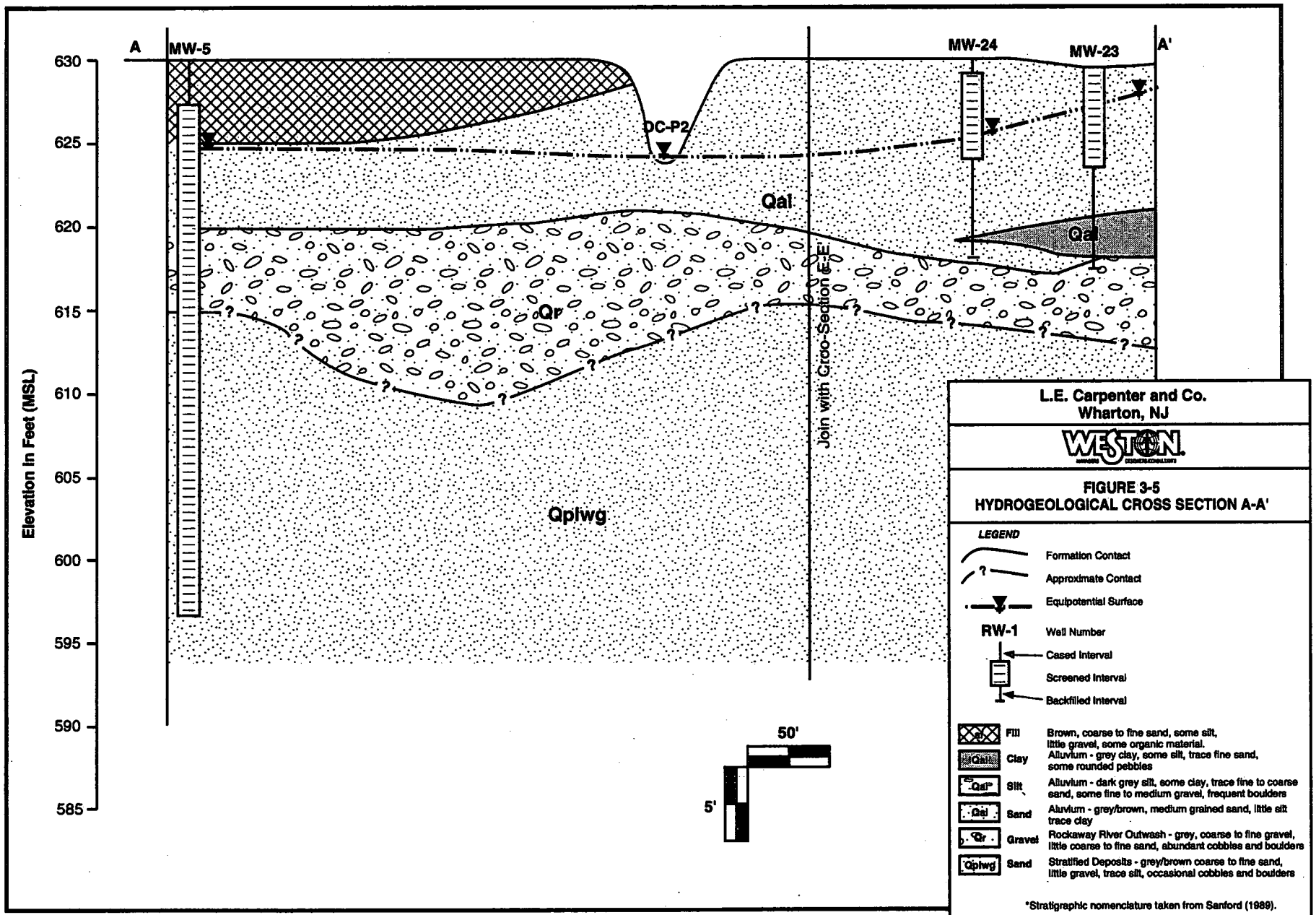
Source: USDOA (1976)

File: LECAR4.DRW

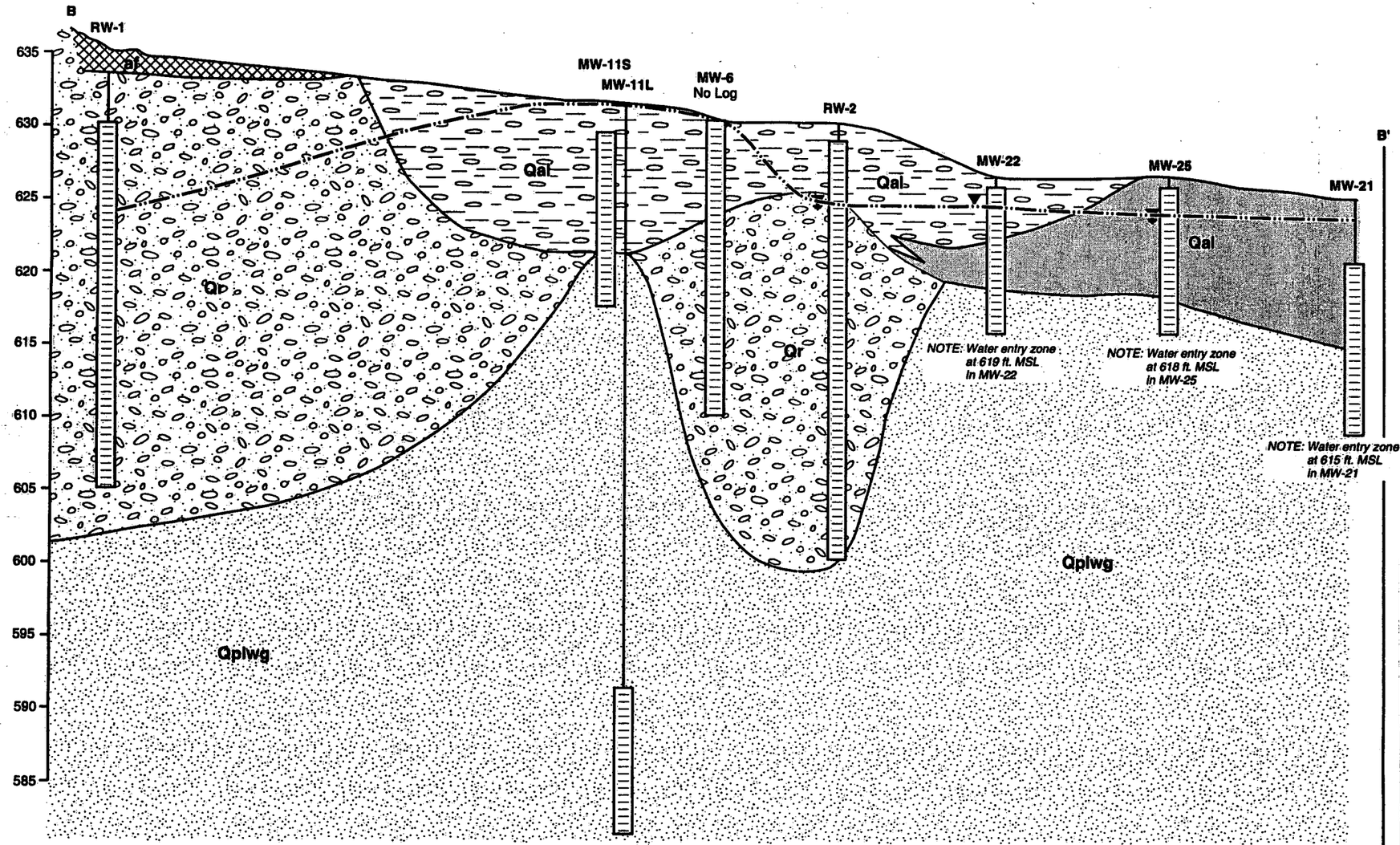


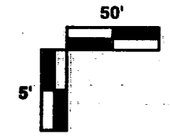
947-8263

FIGURE 3-4 SUBCROP MAP SHOWING THE AERIAL EXTENT OF THE SILT AND CLAY UNITS AT THE 7 FT. BGS LEVEL, ALL MONITORING WELLS AND ALL CROSS SECTIONS


A
MW-5
MW-24
MW-23
A'
DC-P2
630
625
620
615
610
605
600
595
590
585
Elevation in Feet (MSL)
Qal
Qal
Qr
Qplwg
Join with Cross-Section E-E'
50'
5'
L.E. Carpenter and Co.
Wharton, NJ
WESTON
FIGURE 3-5
HYDROGEOLOGICAL CROSS SECTION A-A'
LEGEND
Formation Contact
Approximate Contact
Equipotential Surface
RW-1
Well Number
Cased Interval
Screened Interval
Backfilled Interval
Fill
Brown, coarse to fine sand, some silt, little gravel, some organic material.
Clay
Alluvium - grey clay, some silt, trace fine sand, some rounded pebbles
Silt
Alluvium - dark grey silt, some clay, trace fine to coarse sand, some fine to medium gravel, frequent boulders
Sand
Alluvium - grey/brown, medium grained sand, little silt trace clay
Gravel
Rockaway River Outwash - grey, coarse to fine gravel, little coarse to fine sand, abundant cobbles and boulders
Sand
Stratified Deposits - grey/brown coarse to fine sand, little gravel, trace silt, occasional cobbles and boulders
*Stratigraphic nomenclature taken from Sanford (1989).

950-7926dd





L.E. Carpenter and Co.
Wharton, NJ

WESTON

FIGURE 3-6
HYDROGEOLOGICAL CROSS SECTION B-B'

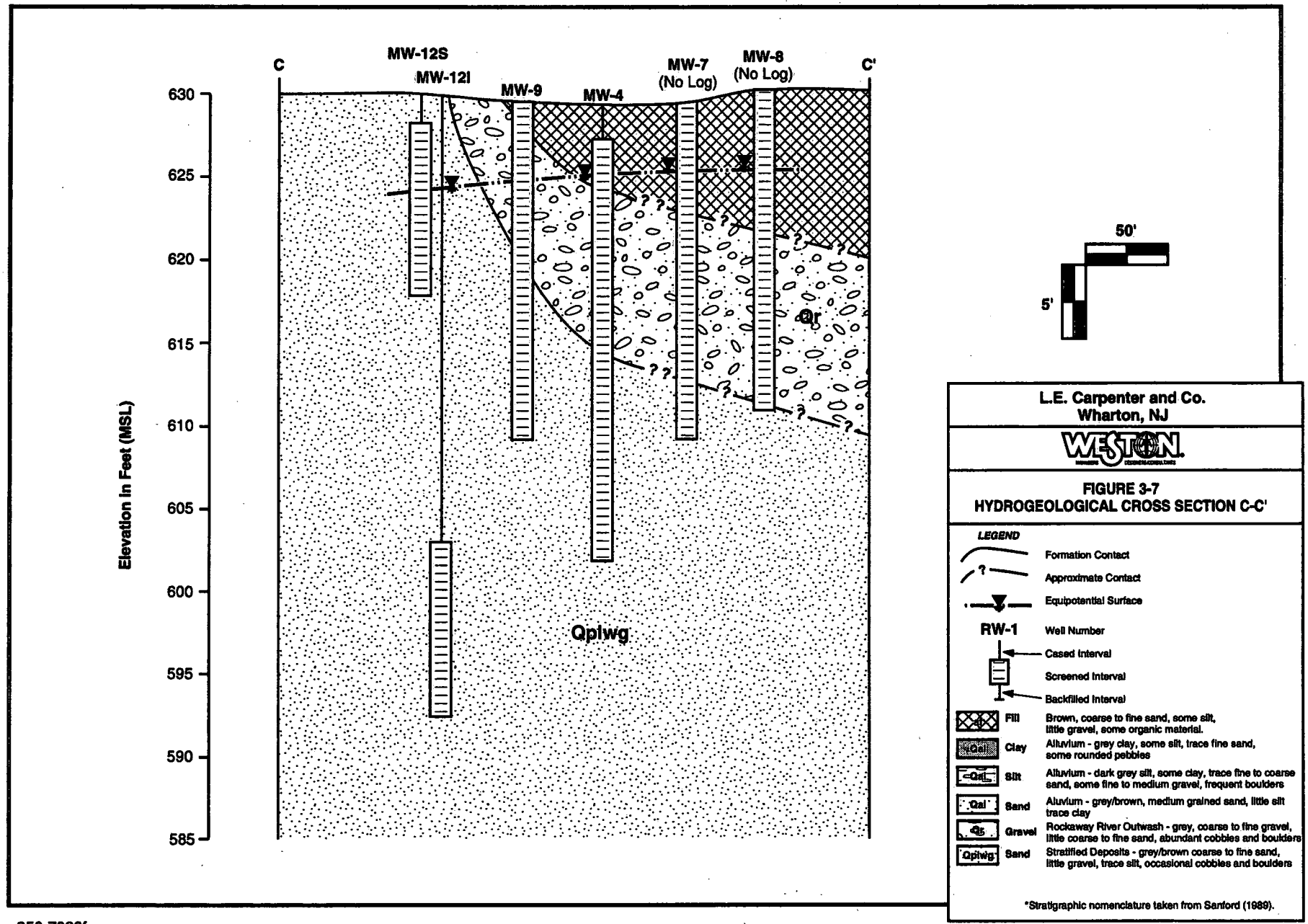
LEGEND

- Formation Contact
- Approximate Contact
- Equipotential Surface
- RW-1 — Well Number
- Cased Interval
- Screened Interval
- Backfilled Interval

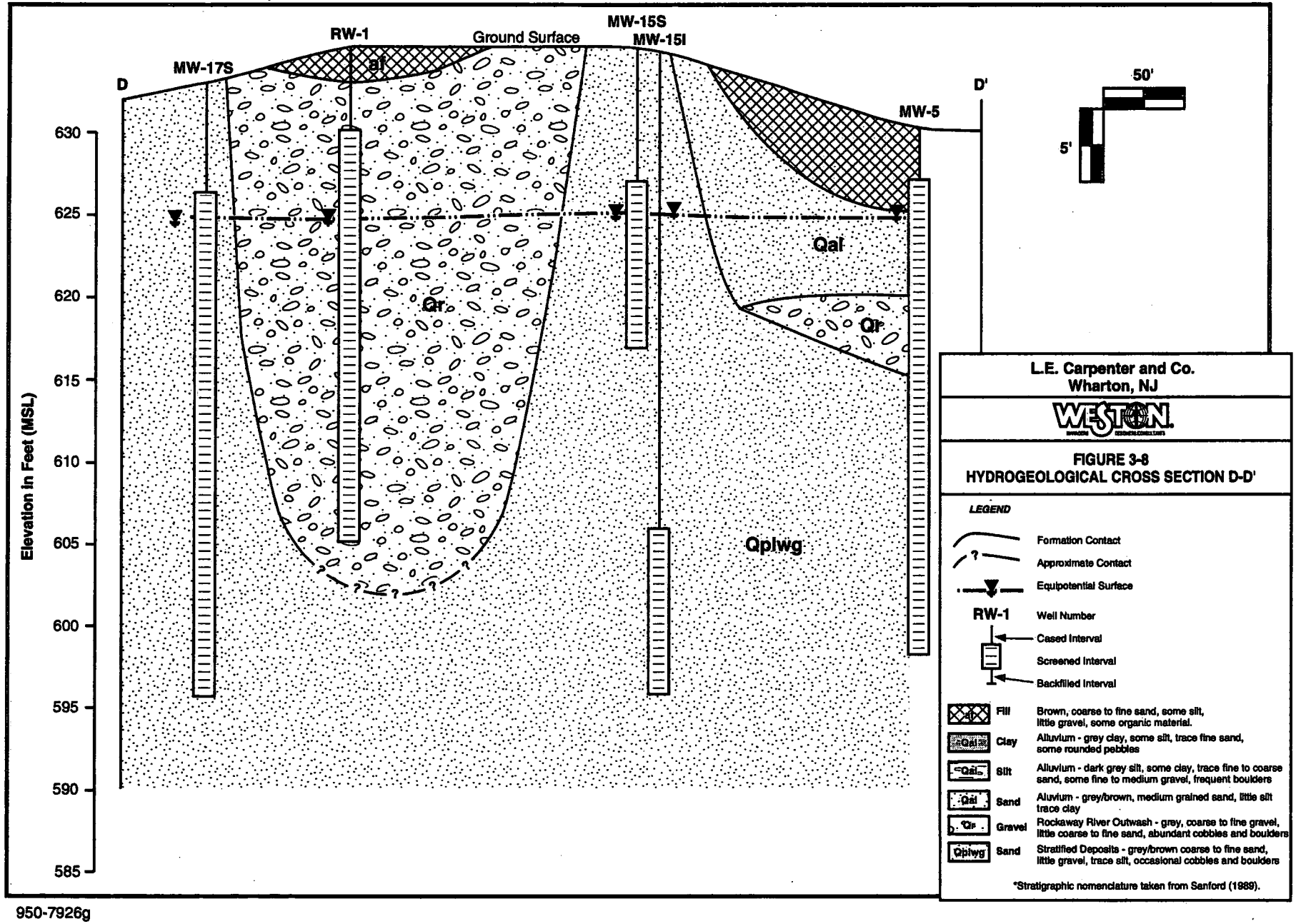
Fill	Fill	Brown, coarse to fine sand, some silt, little gravel, some organic material.
Qal	Clay	Aluvium - grey clay, some silt, trace fine sand, some rounded pebbles
Qal	Silt	Aluvium - dark grey silt, some clay, trace fine to coarse sand, some fine to medium gravel, frequent boulders
Qal	Sand	Aluvium - grey/brown, medium grained sand, little silt trace clay
Qr	Gravel	Rockaway River Outwash - grey, coarse to fine gravel, little coarse to fine sand, abundant cobbles and boulders
Qplwg	Sand	Stratified Deposits - grey/brown coarse to fine sand, little gravel, trace silt, occasional cobbles and boulders

*Stratigraphic nomenclature taken from Sanford (1989).

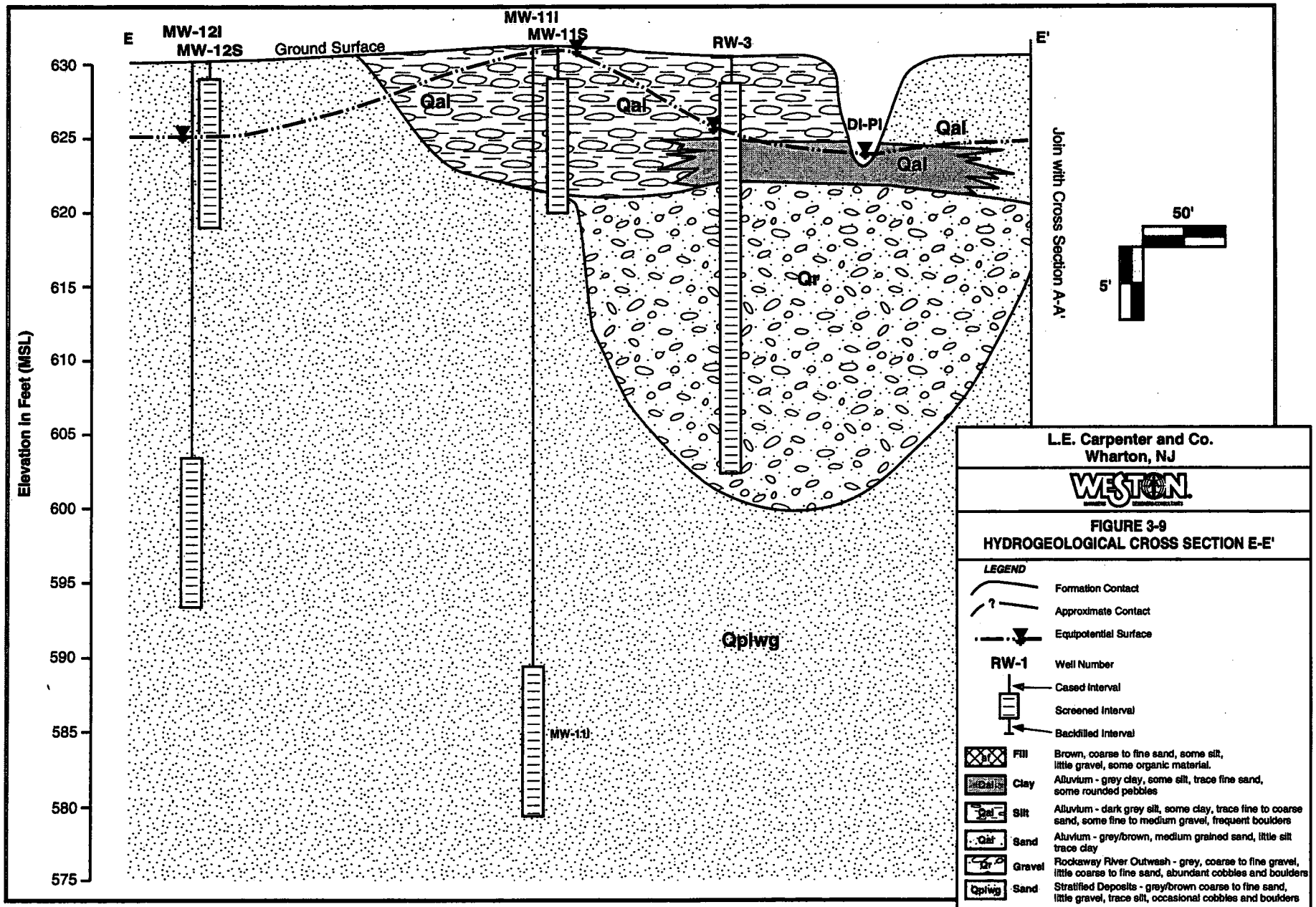
950-7926b


C
C'
MW-12S
MW-12I
MW-9
MW-4
MW-7
(No Log)
MW-8
(No Log)
630
625
620
615
610
605
600
595
590
585
Elevation in Feet (MSL)
Qr
Qplwg
50'
5'
L.E. Carpenter and Co.
Wharton, NJ
WESTON
FIGURE 3-7
HYDROGEOLOGICAL CROSS SECTION C-C'
LEGEND
Formation Contact
Approximate Contact
Equipotential Surface
RW-1
Well Number
Cased Interval
Screened Interval
Backfilled Interval
Fill
Brown, coarse to fine sand, some silt, little gravel, some organic material.
Clay
Alluvium - grey clay, some silt, trace fine sand, some rounded pebbles
Silt
Alluvium - dark grey silt, some clay, trace fine to coarse sand, some fine to medium gravel, frequent boulders
Sand
Alluvium - grey/brown, medium grained sand, little silt trace clay
Gravel
Rockaway River Outwash - grey, coarse to fine gravel, little coarse to fine sand, abundant cobbles and boulders
Sand
Stratified Deposits - grey/brown coarse to fine sand, little gravel, trace silt, occasional cobbles and boulders
*Stratigraphic nomenclature taken from Sanford (1989).

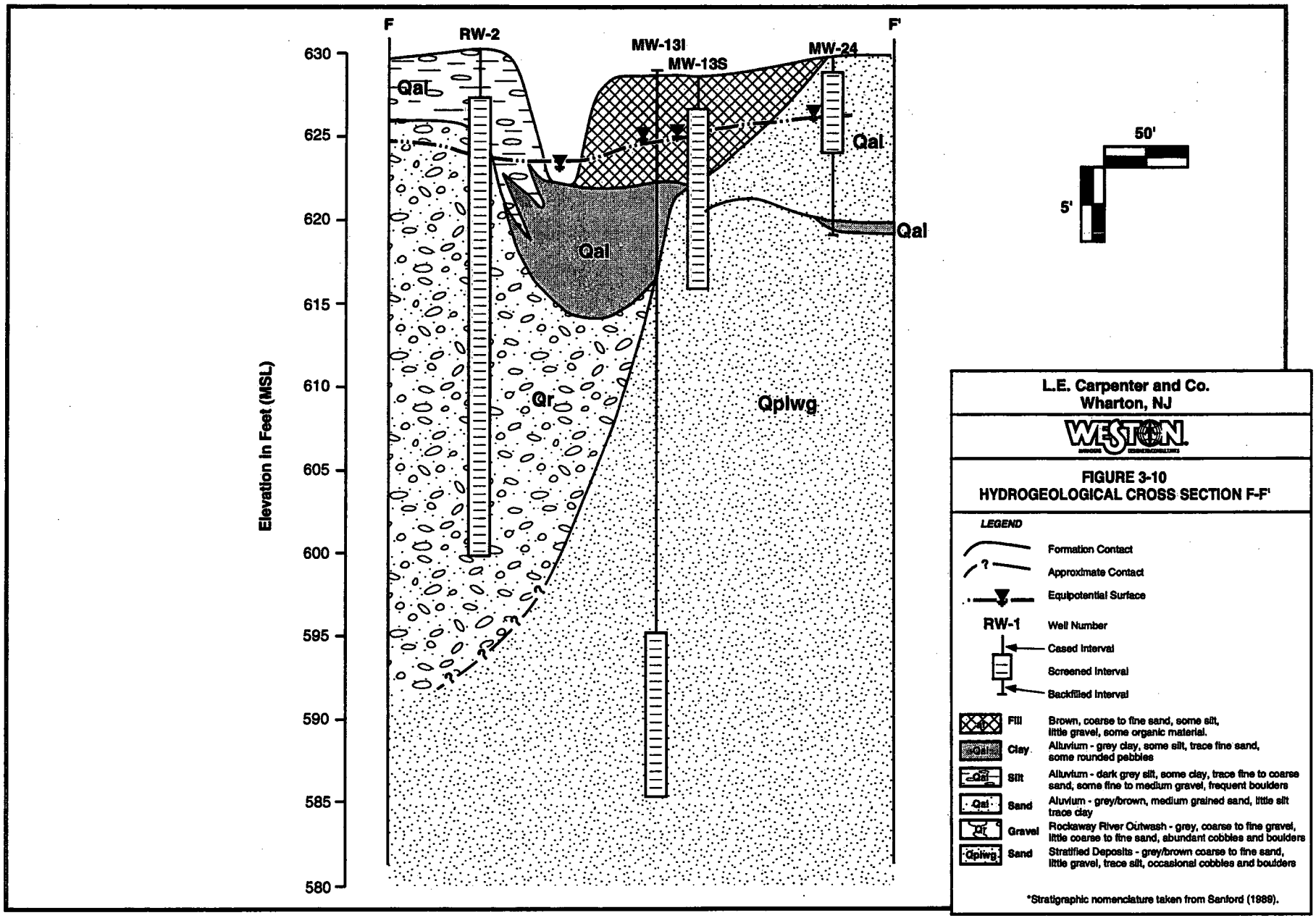
950-7926f


RW-1
Ground Surface
MW-15S
MW-15I
MW-17S
D
D'
MW-5
af
Qal
Qr
Qplwg
Elevation in Feet (MSL)
630
625
620
615
610
605
600
595
590
585
50'
5'
L.E. Carpenter and Co.
Wharton, NJ
WESTON
FIGURE 3-8
HYDROGEOLOGICAL CROSS SECTION D-D'
LEGEND
Formation Contact
Approximate Contact
Equipotential Surface
RW-1
Well Number
Cased Interval
Screened Interval
Backfilled Interval
Fill
Brown, coarse to fine sand, some silt, little gravel, some organic material.
Clay
Alluvium - grey clay, some silt, trace fine sand, some rounded pebbles
Silt
Alluvium - dark grey silt, some clay, trace fine to coarse sand, some fine to medium gravel, frequent boulders
Sand
Alluvium - grey/brown, medium grained sand, little silt trace clay
Gravel
Rockaway River Outwash - grey, coarse to fine gravel, little coarse to fine sand, abundant cobbles and boulders
Sand
Stratified Deposits - grey/brown coarse to fine sand, little gravel, trace silt, occasional cobbles and boulders
*Stratigraphic nomenclature taken from Sanford (1989).

950-7926g


E
E'
MW-12I
MW-12S
MW-11I
MW-11S
RW-3
Ground Surface
DI-PI
Qal
Qr
Qplwg
MW-11I
Join with Cross Section A-A'
50'
5'
Elevation in Feet (MSL)
630
625
620
615
610
605
600
595
590
585
580
575
L.E. Carpenter and Co.
Wharton, NJ
WESTON
FIGURE 3-9
HYDROGEOLOGICAL CROSS SECTION E-E'
LEGEND
Formation Contact
Approximate Contact
Equipotential Surface
RW-1
Well Number
Cased Interval
Screened Interval
Backfilled Interval
Fill
Brown, coarse to fine sand, some silt, little gravel, some organic material.
Clay
Alluvium - grey clay, some silt, trace fine sand, some rounded pebbles
Silt
Alluvium - dark grey silt, some clay, trace fine to coarse sand, some fine to medium gravel, frequent boulders
Sand
Aluvium - grey/brown, medium grained sand, little silt trace clay
Gravel
Rockaway River Outwash - grey, coarse to fine gravel, little coarse to fine sand, abundant cobbles and boulders
Sand
Stratified Deposits - grey/brown coarse to fine sand, little gravel, trace silt, occasional cobbles and boulders
*Stratigraphic nomenclature taken from Sanford (1989).

950-7926ee


F
F'
RW-2
MW-13I
MW-13S
MW-24
Qal
Qal
Qal
Qal
Qr
Qplwg
630
625
620
615
610
605
600
595
590
585
580
Elevation in Feet (MSL)
50'
5'
L.E. Carpenter and Co.
Wharton, NJ
WESTON
FIGURE 3-10
HYDROGEOLOGICAL CROSS SECTION F-F'
LEGEND
Formation Contact
Approximate Contact
Equipotential Surface
RW-1
Well Number
Cased Interval
Screened Interval
Backfilled Interval
Fill
Brown, coarse to fine sand, some silt, little gravel, some organic material.
Clay
Alluvium - grey clay, some silt, trace fine sand, some rounded pebbles
Silt
Alluvium - dark grey silt, some clay, trace fine to coarse sand, some fine to medium gravel, frequent boulders
Sand
Alluvium - grey/brown, medium grained sand, little silt trace clay
Gravel
Rockaway River Outwash - grey, coarse to fine gravel, little coarse to fine sand, abundant cobbles and boulders
Sand
Stratified Deposits - grey/brown coarse to fine sand, little gravel, trace silt, occasional cobbles and boulders
*Stratigraphic nomenclature taken from Sanford (1989).

950-7926a

These deposits exhibit trending heterogeneity defined by an overall decrease in grain size, porosity, and permeability from northwest to southeast. Figure 3-4 depicts this trending heterogeneity by displaying the distribution of textural variations in the unit at the 7 foot BGS level. A lobe of Qal silt extends as far west as MW-5. Within this lobe, the grainsize decreases and the clay content increases to the east. At RW-3 the unit occurs as a gray silty clay. Still further east in the vicinity of MW-22, MW-25, and MW-21, the unit is a gray, very stiff clay. The unit extends northward and crops out along the bottom of the Air Products drainage ditch. On the Air Products property, it was observed at MW-13I and MW-23 but not at MW-13S. Only a very thin (approximately three inches) layer was observed at MW-24. As indicated by observations made when drilling the above referenced wells, the unit is both heterogeneous and discontinuous.

3.5.2 Site Hydrogeology

During this remedial investigation, the subsurface hydrogeology of the site was divided into shallow (0 to 30 feet BGS), intermediate (31 to 40 feet BGS) and deep (40 to 170 feet BGS) aquifer zones. Furthermore, in the area of Qal silt, at 0 to 15 feet BGS, the first groundwater encountered (potentially perched) is referred to as the shallow(a) aquifer zone. This aquifer zone appears to be hydraulically connected to the Air Products drainage ditch. The intermediate and deep aquifer zones are monitored via wells screened solely within the stratified drift deposits (Qplwg). The shallow aquifer zone(s) are monitored via wells screened across the water table within the Rockaway River outwash deposits (Qr) and/or the Rockaway River alluvial deposits (Qal). Water level elevations for all site wells are summarized in Tables 3-1, 3-2 and 3-3. The hydraulic evaluations presented in Sections 3.5.2.1 through 3.5.2.3 reveal the following significant hydrogeologic characteristics for the site.

- Within the deep aquifer zone, the horizontal groundwater flow vectors are oriented southeast to northwest across the site. The vertical flow vectors are oriented upward between the deep and the intermediate aquifer zones.

- Within the intermediate aquifer zone, horizontal groundwater flow vectors are oriented west to east, parallel to those of the regional groundwater systems. The vertical flow vectors are oriented downward between the shallow and intermediate aquifer zones.

- The shallow aquifer zone(s) feature a recharge boundary along the Rockaway River, a local recharge zone centered on MW-11S, and a discharge boundary along Air Products drainage ditch. The overall horizontal flow vector orientation is west to east, with all discharge from the shallow(a) zone occurring at the Air Products drainage ditch. In the southeastern portions of the site it is possible that the Qal silt/clay unit may act as a semi-permeable divide between the water table and the deeper groundwater. The shallow(a) aquifer zone may be defined as that portion of the aquifer above the Qal silt/clay unit.

- These flow patterns prohibit organic compound flow from the L.E. Carpenter site to the Rockaway River. The low permeability of the surficial deposits on the eastern portion of the site prohibits significant flow of organic compounds onto the Wharton Enterprises property.

TABLE 3-1. WATER LEVEL ELEVATION AND PRODUCT THICKNESS DATA
MEASURED ON FEBRUARY 27, 1992, L.E. CARPENTER SITE, WHARTON, NJ.

WELL	MEASURING PT. ELEVATION (FT MSL)	DEPTH TO PRODUCT (FT)	DEPTH TO WATER (FT)	PRODUCT THICKNESS OR SHEEN OBSERVATIONS (FT)	OBSERVED WATER LEVEL ELEVATION (FT MSL)	CORRECTED WATER LEVEL ELEVATION (FT MSL)
MW-001	638.97	13.91	14.74	0.83	624.23	624.94
MW-002	633.39		9.32	0.00	624.07	624.07
MW-003	632.27		7.75	0.00	624.52	624.52
MW-004	632.31	7.60	7.85	0.25	624.46	624.68
MW-005	632.20		7.50	0.00	624.70	624.70
MW-006	632.00		7.95	0.00	624.05	630.89
MW-007	630.68		5.22	0.00	625.46	625.46
MW-008	628.79		2.95	0.00	625.84	625.84
MW-009	630.18		4.78	0.00	625.40	625.40
MW-010	633.65	8.90	9.45	0.55	624.20	624.20
MW-11S	632.96		8.55	0.00	624.41	631.76
MW-11I	632.82		8.21	0.00	624.61	624.61
MW-11D	632.42		5.25	0.00	627.17	627.17
MW-12S	633.18	7.88	ALL PRODUCT	6.53	ALL PRODUCT	ALL PRODUCT
MW-12I	633.06		8.62	0.00	624.44	624.44
MW-13S	631.23		6.55	0.00	624.68	624.68
MW-13I	630.66		6.20	0.00	624.46	624.46
MN-14S	628.51		4.16	0.00	624.35	624.35
MW-14I	628.23		3.91	0.00	624.32	624.32
MW-14D	628.53		1.90	0.00	626.63	626.63
MW-15S	636.77		11.79	0.00	624.98	624.98
MW-15I	636.66		11.62	0.00	625.04	625.04
MW-16S	634.47		8.93	0.00	625.54	625.54
MW-16I	634.96		9.92	0.00	625.04	625.04
MW-17S	634.74		9.90	0.00	624.84	624.84
MW-17D	634.86		9.80	0.00	625.06	625.06
MW-18S	631.26		6.41	0.00	624.85	624.85
MW-18I	631.04		6.00	0.00	625.04	625.04
MW-18D	630.77		4.92	0.00	625.85	625.85
MW-019	638.88		13.75	0.00	625.13	625.13
MW-020	636.77		11.26	0.00	625.51	625.51
MW-021	628.80		4.65	0.00	624.15	624.15
MW-022	628.74		4.40	0.00	624.34	624.34
MW-023	630.64		2.85	0.00	627.79	627.79
MW-024	629.03		3.45	0.00	625.58	625.58
MW-025	627.33		3.51	0.00	623.82	623.83
RW-001	637.38		13.25	0.00	624.13	624.13
RW-002	631.68		7.30	0.00	624.38	624.38
RW-003	631.99		7.06	0.00	624.93	624.93
GEI-1I	630.78		5.48	0.00	625.30	625.30
GEI-2S	637.27		11.94	0.00	625.33	625.33
GEI-2I	637.27		12.12	0.00	625.15	625.15
GEI-3I	639.85		14.38	0.00	625.47	625.47

* Estimated water level elevation calculated using a product specific gravity of 0.86.

** Measuring point elevation corrected to top of plastic cover casing.

TABLE 3-1 CONTINUED. WATER LEVEL ELEVATION AND PRODUCT THICKNESS DATA MEASURED ON FEBRUARY 27, 1992, L.E. CARPENTER SITE, WHARTON, NJ.

MEASURING PT.	ELEVATION OF MEASURING Pt. (FT. MSL)	DEPTH TO WATER (FT.)	WATER LEVEL ELEVATION (FT. MSL)
DC-P0	625.73	2.50	623.23
DC-P1	625.26	2.00	623.26
DC-P2	626.79	2.20	624.59
DC-P3	625.22	2.00	623.22
DC-P4	625.10	2.10	623.00
DC-P5	625.16	3.45	621.71
RP-01	629.65	2.85	626.80
RP-02	627.75	1.60	626.15
RP-03	627.11	2.50	624.61

TABLE 3–2. WATER LEVEL ELEVATION AND PRODUCT THICKNESS DATA
MEASURED ON APRIL 7, 1992, L.E. CARPENTER SITE, WHARTON, NJ.

WELL	MEASURING PT. ELEVATION (FT MSL)	DEPTH TO PRODUCT (FT)	DEPTH TO WATER (FT)	PRODUCT THICKNESS OR SHEEN OBSERVATIONS (FT)	OBSERVED WATER LEVEL ELEVATION (FT MSL)	CORRECTED WATER LEVEL ELEVATION (FT MSL)
MW–001	638.97	12.64	14.40	1.76	624.57	626.08
MW–002	633.39		8.92	0.00	624.47	624.47
MW–003	632.27	6.90	7.20	0.30	625.07	625.07
MW–004	632.31	6.62	6.64	0.02	625.67	625.69
MW–005	632.20		6.18	0.00	626.02	626.02
MW–006	632.00		6.44	0.00	625.56	631.10
MW–007	630.68		4.84	0.00	625.84	625.84
MW–008	628.79		2.82	0.00	625.97	625.97
MW–009	630.18		5.62	0.00	624.56	624.56
MW–010	633.65	7.84	8.96	1.12	624.69	624.69
MW–11S	632.96	4.12	ALL PRODUCT	10.29	ALL PRODUCT	ALL PRODUCT
MW–11I	632.82		3.98	0.00	628.84	628.84
MW–11D	632.42		7.08	0.00	625.34	625.34
MW–12S	633.18	7.34	ALL PRODUCT	7.07	ALL PRODUCT	ALL PRODUCT
MW–12I	633.06		7.28	0.00	625.78	625.78
MW–13S	631.23		5.62	0.00	625.61	625.61
MW–13I	630.66		5.18	0.00	625.48	625.48
MW–14S	628.51		3.25	SHEEN	625.26	625.26
MW–14I	628.23		3.88	0.00	624.35	624.35
MW–14D	628.53		0.20	0.00	628.33	628.33
MW–15S	636.77		10.70	0.00	626.07	626.07
MW–15I	636.66		10.60	0.00	626.06	626.06
MW–16S	634.47		7.85	0.00	626.62	626.62
MW–16I	634.96		8.25	0.00	626.71	626.71
MW–17S	634.74		8.44	0.00	626.30	626.30
MW–17D	634.86		8.50	0.00	626.36	626.36
MW–18S	631.26		5.65	0.00	625.61	625.61
MW–18I	631.04		5.14	0.00	625.90	625.90
MW–18D	630.77		2.95	0.00	627.82	627.82
MW–019	638.88		11.90	0.00	626.98	626.98
MW–020	636.77		10.18	0.00	626.59	626.59
MW–021	628.80		3.72	0.00	625.08	625.08
MW–022	628.74		3.38	SHEEN	625.36	625.36
MW–023	630.64		3.48	0.00	627.16	627.16
MW–024	629.03		2.70	0.00	626.33	626.33
MW–025	627.33		2.12	0.00	625.21	625.21
RW–001	637.38		11.30	SHEEN	626.08	626.08
RW–002	631.68		6.30	SHEEN	625.38	625.38
RW–003	631.99		6.35	SHEEN	625.64	625.64
GEI–1I	630.78		4.78	0.00	626.00	626.00
GEI–2S	637.27		10.78	0.00	626.49	626.49
GEI–2I	637.27		10.75	0.00	626.52	626.52
GEI–3I	639.85		12.95	0.00	626.90	626.90

* Estimated water level elevation calculated using a product specific gravity of 0.86.

** Measuring point elevation corrected to top of plastic cover casing.

TABLE 3–2 CONTINUED. WATER LEVEL ELEVATION AND PRODUCT THICKNESS DATA MEASURED ON APRIL 7, 1992, L.E. CARPENTER SITE, WHARTON, NJ.

MEASURING PT.	ELEVATION OF MEASURING PT. (FT. MSL)	DEPTH TO WATER (FT.)	WATER LEVEL ELEVATION (FT. MSL)
DC–P0	625.73	2.50	623.23
DC–P1	625.26	1.83	623.43
DC–P2	626.79	3.33	623.46
DC–P3	625.22	2.08	623.14
DC–P4	625.10	2.00	623.10
DC–P5	625.16	2.17	622.99
RP–01	629.65	2.90	626.75
RP–02	627.75	1.72	626.03
RP–03	627.11	2.46	624.65

TABLE 3-3. SUMMARY OF WATER LEVEL DATA FOR 1991, L.E. CARPENTER SITE, WHARTON, NJ.

WELL NUMBER	2/4/91	3/4/91	4/15/91	5/13/91	7/17/91	8/14/91	9/15/91	10/30/91	11/15/91	12/18/91	MEAN ANNUAL WATER LEVEL *
MW-001	626.53	626.26	626.53	625.60	624.68	624.62	624.20	624.38	624.40	625.13	625.10
MW-002	625.57	626.15	625.72	626.07	624.37	624.11	623.73	623.87	623.89	623.69	624.74
MW-003	625.46	626.28	625.46	624.56	624.11	624.12	623.73	623.89	623.98	624.30	624.32
MW-004	625.82	626.40	625.88	626.33	624.40	624.10	623.72	623.92	624.05	ALL PR.	625.06
MW-005	626.17	626.89	626.20	626.67	624.91	624.66	624.17	624.42	624.90	624.90	625.39
MW-006	624.84	626.02	630.97	625.00	624.53	623.54	623.52	623.16	624.72	624.57	624.40
MW-007	625.47	627.05	625.83	625.62	623.98	623.82	623.90	623.60	624.56	ALL PR.	624.87
MW-008	626.01	625.65	625.87	625.99	624.83	624.87	625.53	623.59	625.64	625.65	625.36
MW-009	626.03	625.86	625.81	626.32	624.68	623.46	624.30	624.75	625.18	623.64	625.00
MW-010	622.31	622.87	624.18	622.88	623.32	623.77	623.33	623.39	624.03	624.47	623.33
MW-11S	625.4	626.06	625.16	626.46	ALL PR.	ALL PR.	ALL PR.	ALL PR.	ALL PR.	624.01	622.00
MW-11I	625.32	626.25	625.64	626.26	624.40	624.12	623.72	623.90	624.22	624.56	624.84
MW-11D	625.28	628.78	628.51	629.33	626.92	626.46	625.56	625.91	625.92	626.60	626.22
MW-12S	625.9	NO ACC	625.61	626.18	625.20	625.42	625.35	625.27	625.35	ALL PR.	625.51
MW-12I	625.92	626.24	625.67	626.33	624.41	624.41	623.62	623.84	625.96	624.54	625.09
MW-13S	NO ACC	NO ACC	NO ACC	NO ACC	624.23	623.73	623.73	623.73	624.93	624.73	624.18
MW-13I	NO ACC	NO ACC	NO ACC	NO ACC	624.15	623.95	623.56	623.66	623.86	624.34	623.92
MN-14S	625.34	625.71	625.15	625.65	624.01	623.80	623.41	623.59	623.81	624.21	624.47
MW-14I	625.45	625.82	625.23	625.79	624.05	623.79	623.35	623.29	623.83	624.27	624.49
MW-14D	ART.	ART.	ART.	ART.	626.77	626.34	625.41	625.83	626.13	626.49	626.16
MW-15S	626.25	626.36	625.92	626.56	624.67	624.38	623.97	623.87	624.47	624.01	625.05
MW-15I	626.21	626.62	625.92	626.58	624.70	624.41	623.98	624.17	624.41	624.81	625.18
MW-16S	626.75	627.63	626.50	627.16	625.13	624.91	624.09	624.64	625.07	625.37	625.73
MW-16I	626.82	627.11	626.48	627.24	625.21	624.46	624.10	624.64	624.76	625.34	625.62
MW-17S	626.45	626.96	626.13	626.93	624.82	624.54	624.15	624.29	624.44	624.98	625.37
MW-17D	626.55	626.86	627.22	626.96	624.88	624.61	624.16	624.32	624.56	625.04	624.55
MW-18S	625.66	626.07	625.45	625.83	NA	624.36	623.96	624.14	624.46	624.66	624.95
MW-18I	625.94	626.36	625.75	626.19	624.66	624.43	623.84	624.20	624.49	624.86	625.07
MW-18D	628.19	628.13	627.76	628.65	626.19	625.67	624.87	625.17	624.02	625.86	625.29
MW-19	NA	NA	NA	NA	625.50	625.22	624.56	624.97	625.18	625.78	625.20
MW-20	NA	NA	NA	NA	625.19	624.93	624.47	624.65	624.97	625.41	624.94
MW-21	NA	NA	NA	NA	623.82	623.56	623.19	623.37	623.70	624.02	623.61
RW-1	NA	NA	NA	NA	624.70	624.42	623.80	624.14	624.38	624.86	624.38
RW-2	NA	NA	NA	NA	623.98	623.88	623.47	623.65	623.98	624.35	623.88
RW-3	NA	NA	NA	NA	624.43	624.04	623.67	623.74	624.09	624.47	624.07
GEI-1I	626.04	626.43	625.80	626.28	NO ACC	625.20	625.20	623.87	624.08	624.92	625.31
GEI-2S	626.91	NO ACC	NO ACC	NO ACC	NO ACC	624.45	624.45	624.45	624.57	625.23	625.01
GEI-2I	627.50	NO ACC	NO ACC	NO ACC	NO ACC	624.90	624.90	624.29	624.52	625.07	625.20
GEI-3I	627.06	627.29	626.78	627.52	NO ACC	624.80	624.80	624.85	625.00	625.45	625.95
DC-P0	NA	NA	NA	NA	623.31	623.38	623.32	623.35	623.23	625.73	623.72
DC-P1	NA	NA	NA	NA	623.38	623.47	623.31	623.43	623.26	625.26	623.69
DC-P2	NA	NA	NA	NA	623.39	623.58	623.55	623.60	623.39	626.79	624.05
DC-P3	NA	NA	NA	NA	623.24	623.28	623.22	623.27	623.32	625.22	623.59
DC-P4	NA	NA	NA	NA	623.21	623.04	622.90	623.02	622.70	625.10	623.33
DC-P5	NA	NA	NA	NA	622.87	622.70	622.87	622.97	622.86	625.16	623.24
RP-1	626.44	627.55	626.55	627.59	626.15	625.99	626.20	626.23	626.50	629.65	626.89
RP-2	624.57	627.37	625.95	624.57	624.93	625.49	625.60	625.79	625.86	627.75	625.79
RP-3	626.78	625.01	624.49	624.57	623.94	624.13	624.20	624.28	624.46	627.11	624.90

ART. = ARTESIAN
ALL PR. = ALL PRODUCT
NA = DATA NOT AVAILABLE
NO ACC = NO ACCESS TO WELL
* = ARITHMETIC MEAN WATER LEVEL CALCULATED FOR NON-ARTESIAN CONDITIONS ONLY
ELEVATION DATA PRESENTED IN FT. MSL

3.5.2.1 Pre-Late Wisconsin Stratified Drift (Oplwg)

Slug tests conducted during the initial RI activities in the intermediate and deep wells indicate that the hydraulic conductivity of the stratified drift deposits range from a geometric mean of 43.03 ft/day for the intermediate wells to a geometric mean of 28.29 ft/day for the deep wells.

Water level elevations in all site monitoring wells measured on 27 February and 7 April 1992 are presented in Tables 3-1 and 3-2. A summary of water level elevations for 1991 is presented in Table 3-3. Mean seepage velocities for the stratified drift deposits can be calculated by incorporating data presented in Table 3-3 into Darcy's law as follows:

$$Vs = \frac{K\ dh}{ne\ dl}$$

Where: K = hydraulic conductivity
ne = effective porosity
$\frac{dh}{dl}$ = hydraulic gradient

The hydraulic gradients for the intermediate and deep aquifer zones can be determined from water level measurements made at MW-11I, MW-11D, MW-14I, and MW-14D, as follows:

Intermediate aquifer zone:

$$\frac{dh}{dl} = \frac{h_1 - h_2}{dl} = \frac{0.35\ ft}{275\ ft.} = 1.27 \times 10^{-3}\ ft/ft$$

Where: h_1 = water level elevation at MW-11I - 624.84 ft. MSL
h_2 = water level elevation at MW-14I = 624.49 ft. MSL
dl = horizontal distance between MW-11I and MW-14I = 275 ft.

Deep aquifer zone:

$$\frac{dh}{dl} = \frac{h_3 - h_4}{dl} = \frac{0.06\ ft}{303\ ft.} = 1.98 \times 10^{-4}\ ft/ft$$

Where: h_1 = water level elevation at MW-11D - 626.22 ft. MSL
h_2 = water level elevation at MW-14D = 626.16 ft. MSL
dl = horizontal distance between MW-14D and MW-11D = 303 ft.

An effective porosity of 0.28 can be derived from Freeze and Cherry (1979, p. 37). These values can be inserted into Darcy's equation to determine the mean seepage velocities for the intermediate and deep aquifer zones as follows:

Intermediate aquifer zone:

$$Vs = \frac{K}{ne}\frac{dh}{dl} = \frac{43.03}{0.28}\ 1.27x10^{-3} = 0.20 \text{ ft/day}$$

Deep aquifer zone:

$$Vs = \frac{K}{ne}\frac{dh}{dl} = \frac{36.89}{0.28}\ 1.98x10^{-4} = 0.02 \text{ ft/day}$$

Mean 1991 equipotential maps for the deep and intermediate aquifer zones are presented in Figures 3-11 and 3-12. The groundwater flow lines in Figure 3-12 effectively show that in the horizontal plane the direction of groundwater flow in the deep aquifer zone is northwest. This is due primarily to an elevated area in the potentiometric surface centered on MW-14D.

In the intermediate zone (Figure 3-11), the groundwater flow lines mimic the regional flow pattern and are oriented west to east, parallel to the flow of the Rockaway River. A comparison of the mean water level elevation between the intermediate and deep wells (see Table 3-3) shows that the vertical hydraulic gradients are upward.

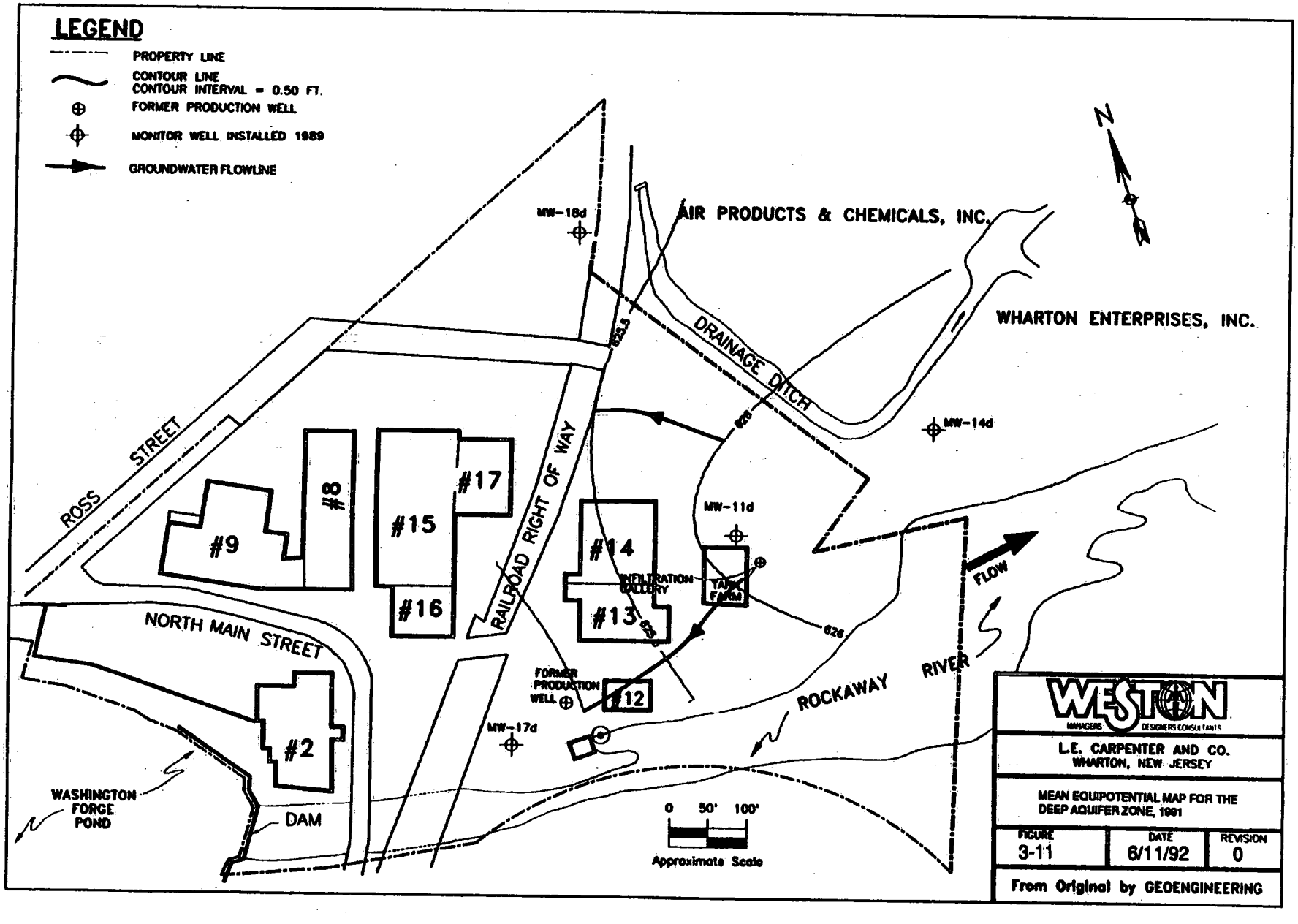
3.5.2.2 Rockaway River Outwash Deposit (Qr)

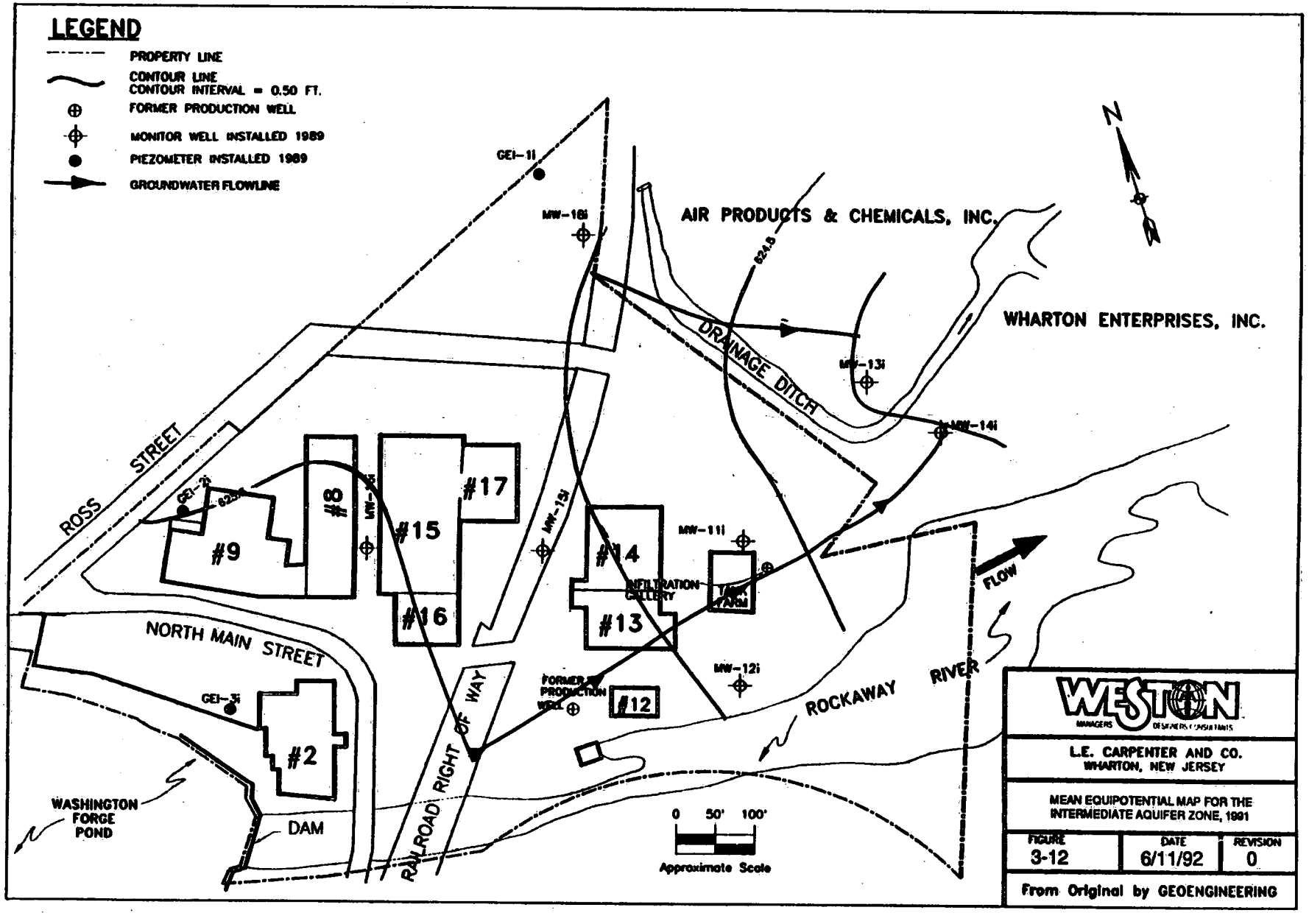
The shallow aquifer zone is partially comprised of Rockaway River outwash deposits (Qr). These deposits form two main channels across the L.E. Carpenter site (see Section 3.5.1.2.2). The geometric mean hydraulic conductivity value derived from intermediate and deep aquifer zones (i.e., 36.76 ft/day) can be used as an approximation of hydraulic conductivity for these channel deposits. If data from RW-2 and RW-3 (both screened within the same channel deposit) are used in Darcy's equation, the resulting seepage velocity is as follows:

$$Vs = \frac{K\ dh}{ne\ dl}$$

Where K = 36.76 ft/day geometric mean K for the intermediate and deep aquifer zones.
ne = 0.30 (Freeze & Cherry, p. 37)
$\frac{dh}{dl} = \frac{0.19 \text{ ft.}}{112 \text{ ft.}}$ 1.70 x 10^{-3} ft/ft (Table 3-3)

$$Vs = \frac{(36.76)\ (1.70x10^{-3})}{(0.30)} = 0.21 \text{ ft/day}$$


LEGEND
PROPERTY LINE
CONTOUR LINE
CONTOUR INTERVAL = 0.50 FT.
FORMER PRODUCTION WELL
MONITOR WELL INSTALLED 1989
GROUNDWATER FLOWLINE
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
MW-18d
MW-14d
MW-11d
MW-17d
DRAINAGE DITCH
RAILROAD RIGHT OF WAY
ROSS STREET
NORTH MAIN STREET
#2
#8
#9
#15
#16
#17
#14
#13
#12
INFILTRATION GALLERY
TANK FARM
FORMER PRODUCTION WELL
FLOW
ROCKAWAY RIVER
WASHINGTON FORGE POND
DAM
0 50' 100'
Approximate Scale
WESTON
MANAGERS DESIGNERS CONSULTANTS
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
MEAN EQUIPOTENTIAL MAP FOR THE DEEP AQUIFER ZONE, 1991
FIGURE 3-11
DATE 6/11/92
REVISION 0
From Original by GEOENGINEERING


LEGEND
PROPERTY LINE
CONTOUR LINE
CONTOUR INTERVAL = 0.50 FT.
FORMER PRODUCTION WELL
MONITOR WELL INSTALLED 1989
PIEZOMETER INSTALLED 1989
GROUNDWATER FLOWLINE
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
DRAINAGE DITCH
ROSS STREET
NORTH MAIN STREET
RAILROAD RIGHT OF WAY
ROCKAWAY RIVER
FLOW
WASHINGTON FORGE POND
DAM
INFILTRATION GALLERY
FORMER PRODUCTION WELL
#2
#8
#9
#12
#13
#14
#15
#16
#17
GEI-1i
GEI-2i
GEI-3i
MW-16i
MW-15i
MW-13i
MW-14i
MW-11i
MW-12i
624.5
0 50' 100'
Approximate Scale
WESTON
MANAGERS
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
MEAN EQUIPOTENTIAL MAP FOR THE INTERMEDIATE AQUIFER ZONE, 1991
FIGURE 3-12
DATE 6/11/92
REVISION 0
From Original by GEOENGINEERING

3.5.2.3 Rockaway River Alluvial Deposits (Qal)

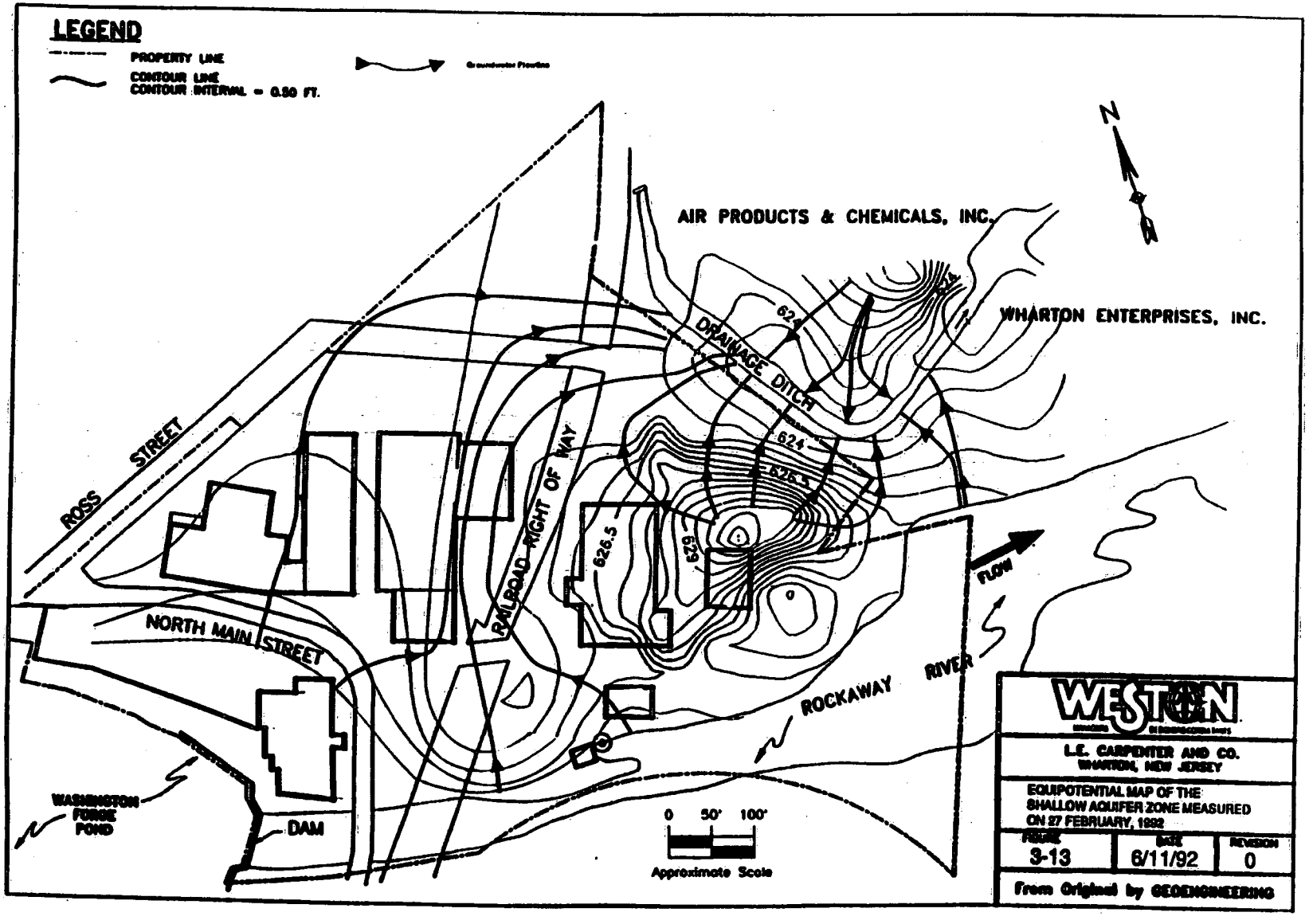
The remainder of the shallow aquifer zone is comprised of Rockaway River alluvial deposits. As discussed in Section 3.5.1.2.3 above, the geometry and texture of these deposits is complex. Although hydraulic data from wells screened exclusively within the deposits are not available, field observations reveal the significant characteristics. The geologic log for RW-2 indicates that these deposits feature a high moisture content above the water table and are saturated at and below the water table. Further east at MW-21, the formation was observed to be dry even at levels which were below the static water level once the well was completed. This indicates that both the formation permeability and corresponding hydraulic conductivity decrease toward the east on the Wharton Enterprises property. The logs for monitor wells MW-21, MW-22 and MW-25 indicate that the permeability of the Qal clay is very low. As such, the unit constitutes an "aquitard" in that it retards the flow of groundwater. At these wells, the water entry zones were below the Qal clay aquitard and within the Qplwg sand. Subsequent to the completion of these wells, water from the Qplwg sand rose within the well-bore to the levels depicted in Figure 3-6. The water rose to these levels under the influence of vertical hydraulic gradients caused by the permeability contrast between the Qplwg sand and the Qal clay. The water levels in these wells represent the potentiometric surface, not the water table surface.

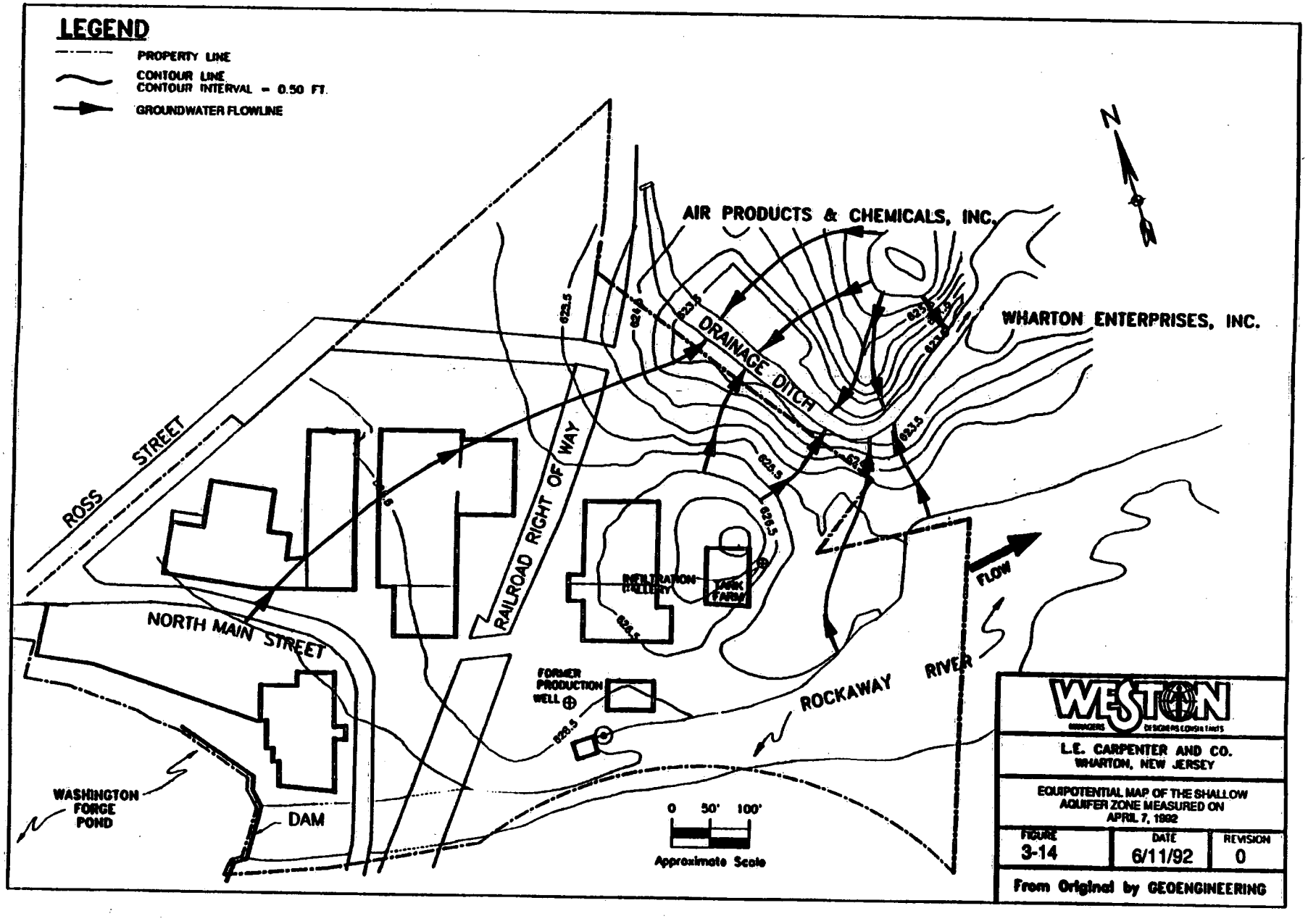
3.5.2.4 Summary of Groundwater Flow in the Shallow Aquifer Zone

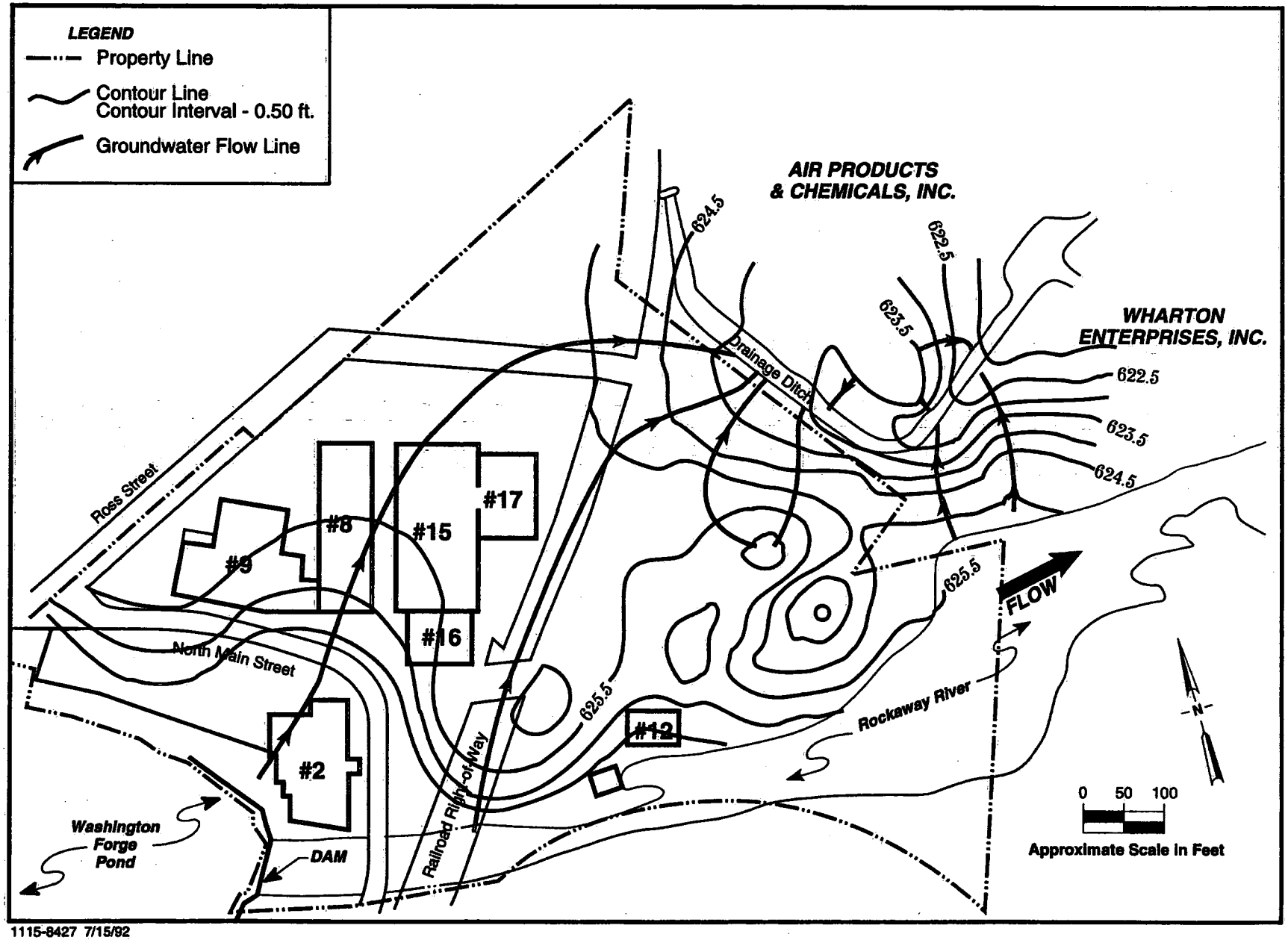
Figures 3-13 and 3-14 are plots of the shallow aquifer zone equipotential surface based on measurements obtained at the site on 27 February and 7 April 1992 (see Table 3-1 and 3-2). The 27 February 1992 measurements were obtained while the EIPRS system was in full operation. All of the floating product normally present at MW-11S had been removed by the system. A significant rain event had occurred over the three days prior to the water level measurement activities. A large elevated area in the groundwater table was present in the vicinity of MW-11S indicating that groundwater recharge was occurring at that location. The groundwater flow lines radiate outward from this area.

The 7 April 1992 measurements were made while the EIPRS system was shut-down for routine maintenance. Under static (non-pumping) conditions, the thickness of the floating product at MW-11S was greater than the saturated screen length, thus prohibiting actual product thickness measurements. The product thickness value of 10.29 feet presented in Table 3-2 represents the minimum value calculated by subtracting the bottom-of-screen elevation from the top-of-product elevation. The resulting equipotential pattern presented in Figure 3-11 is similar to February's equipotential map (Figure 3-10).

A map of the shallow aquifer zone mean equipotential surface for 1991 based on the data presented in Table 3-3 is presented in Figure 3-15. The map shows that the same general patterns presented in Figures 3-13 and 3-14 are persistent through seasonal variations in recharge


LEGEND
PROPERTY LINE
CONTOUR LINE
CONTOUR INTERVAL = 0.50 FT.
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
DRAINAGE DITCH
624
624
625.5
626.5
626
ROSS STREET
RAILROAD RIGHT OF WAY
NORTH MAIN STREET
ROCKAWAY RIVER
FLOW
WASHINGTON FORGE POND
DAM
0 50' 100'
Approximate Scale
WESTON
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
EQUIPOTENTIAL MAP OF THE SHALLOW AQUIFER ZONE MEASURED ON 27 FEBRUARY, 1992
FIGURE 3-13
DATE 6/11/92
REVISION 0
From Original by GEOENGINEERING


LEGEND
PROPERTY LINE
CONTOUR LINE
CONTOUR INTERVAL = 0.50 FT.
GROUNDWATER FLOWLINE
N
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
DRAINAGE DITCH
ROSS STREET
RAILROAD RIGHT OF WAY
NORTH MAIN STREET
INFILTRATION GALLERY
TANK FARM
FORMER PRODUCTION WELL
FLOW
ROCKAWAY RIVER
WASHINGTON FORGE POND
DAM
0 50' 100'
Approximate Scale
WESTON
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
EQUIPOTENTIAL MAP OF THE SHALLOW AQUIFER ZONE MEASURED ON APRIL 7, 1992
FIGURE 3-14
DATE 6/11/92
REVISION 0
From Original by GEOENGINEERING



1115-8427 7/15/92

FIGURE 3-15 MAP OF THE MEAN EQUIPOTENTIAL SURFACE FOR THE SHALLOW AQUIFER ZONE, 1991 L.E. CARPENTER PROPERTY, L.E. CARPENTER SITE, WHARTON, NJ

and discharge conditions. All three equipotential maps (Figures 3-10, 3-11, and 3-12) show groundwater flow lines which point away from the Rockaway River, indicating that the river is a recharge boundary. A local recharge area is persistent in the vicinity of MW-11S. Groundwater flows radially outward from this location. All flow lines lead to the Air Products drainage ditch indicating that the ditch is a discharge boundary.

3.6 Disposal Area Investigation

The objective of this investigation was to confirm the presence of subsurface drums and to estimate the extent of former fill areas encountered during installation of the EIPRS. From 27 January 1992 to 29 January 1992, WESTON completed nine exploratory test pits at the L.E. Carpenter site. Most trenches were limited to a depth of 4 feet BGS, to avoid encountering and possibly impacting groundwater in the vicinity. Trench 2 was completed at a depth of approximately 10 feet, in order to determine vertical extent of the fill material. Figure 3-16 depicts the approximate locations of all trenches.

The first trench was dug in a north-south direction parallel to the EIPRS recovery pipe running between RW-3 and MW-6 (Figure 3-16). The trench was dug approximately eight feet from the pipe as shown in Photo 1. Shortly after beginning the trench and breaking through the frost line, an obvious fill material was noticed. This fill appeared to be a dried sludge. Volatile organic survey readings of up to 30 units were obtained directly adjacent to the pit. The excavation was continued to a depth of four feet and then the trench was extended parallel to the recovery pipe at that depth. At three feet from the starting point, the first drum was encountered. The drum was partially intact, and appeared to contain a solid material similar in appearance to the surrounding fill layer. Drum debris and metal, pieces of wood, and the grayish-white chalky fill material was encountered throughout this trench. The chalky material appeared to be in very defined, compacted layers.

Trench 2 was located approximately five feet northeast of MW-6 and was parallel to the pipe line running between MW-6 and RW-2. The trench extended into the area where the drum had been located during the EIPRS piping installation. Drum debris was found along with the grayish white, chalky fill material. A sample of the fill, designated #129-001, was collected from the western corner of the trench. This sample was analyzed for priority pollutant constituents and TCLP parameters.

Trench 3 was oriented perpendicular to Trench 1. Drum remains and fill material were also encountered in this trench. The trench extended approximately 45 feet from the recovery pipe between RW-3 and MW-6 and appears to represent the eastern border of fill material. A second sample (#129-002) was collected from the northern juncture of Trenches 1 and 3. This sample was also analyzed for priority pollutant and TCLP parameters.

Trench 4 was excavated in a northwesterly direction from MW-6. The trench originated approximately 17 feet west of MW-6 and extended 51 feet in length. The trench was terminated

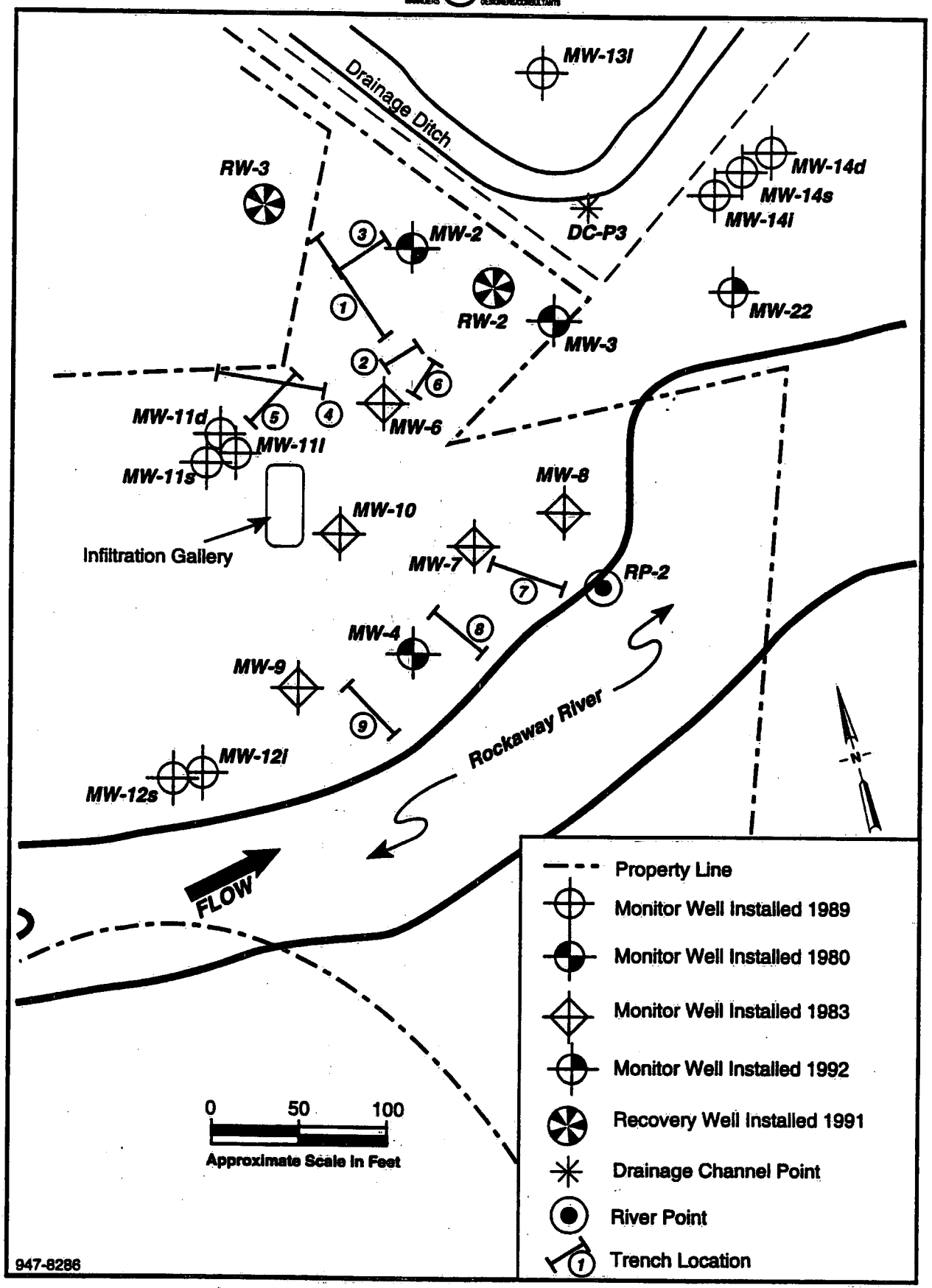


FIGURE 3-16 DISPOSAL AREA INVESTIGATION
L.E. CARPENTER SITE, WHARTON, NJ

at the blacktop pad (former parking area). No drums or carcasses were encountered in this trench. However, fill material similar in appearance and texture to that found in Trenches 1, 2, and 3 was evident.

At the point where the fill material appeared to stop in Trench 4, Trench 5 was initiated. Trench 5 was constructed off of Trench 4 in a southerly direction. Trench 5 was continued for approximately 25 feet and was about 4 feet wide. The fill material was evident for a portion of the trench. The southern extent of the fill material appears to be in the vicinity of MW-6.

Trench 6 was located east of MW-6 and ran parallel to the EIPRS recovery pipe between MW-6 and RW-2. It was approximately 18 feet in length and 5 feet wide. This trench was excavated in order to try to delineate the southern boundary of the fill area. Fill material was evident for the entire length of the trench, but no drums were discovered.

In order to verify suspicions of additional disposal areas which were identified during completion of an aerial photograph review by NJDEPE, three additional trenches were dug. Trenches 7, 8, and 9 were completed at the southern end of the L.E. Carpenter site along the border of the site adjacent to the Rockaway River. Neither drum debris or sludge-type fill was evident in Trenches 7 through 9. Upon completion of all trenching activities, a total of 11 drum carcasses were staged to await waste classification and off-site disposal.

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SECTION 4.0

NATURE AND EXTENT OF CONTAMINATION

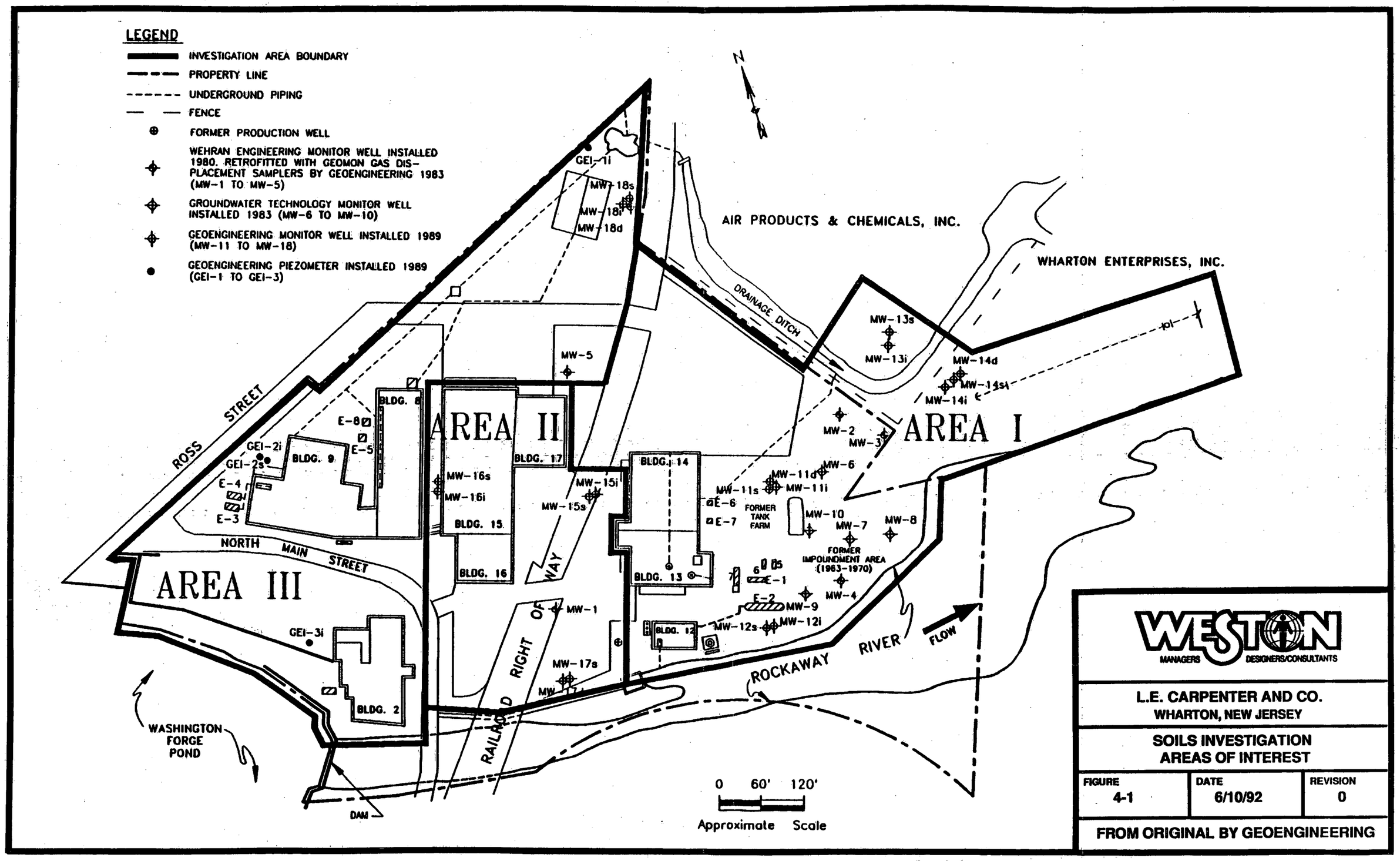
Section 4 presents a summary of analytical results and findings of the various investigations conducted throughout the RI, SRI, and those efforts completed since the SRI.

4.1 Soils

All soils data (except where expressly noted) presented herein may be found in the Revised Report of Remedial Investigation Findings, Volume II, Data Tables. The following subsection describes the locations and areal extent of contaminants detected at concentrations greater than levels of concern. For discussion purposes, contaminant concentrations were compared to the New Jersey Cleanup Standards for Contaminated Sites (N.J.A.C. 7:26D, proposed in the New Jersey Register on 3 February 1992). The cleanup standards, as proposed, were developed in order to provide guidance for remediation goals and are intended, according to NJDEPE, to be applicable to all regulated remediation sites.

The cleanup standards are defined for residential and non-residential settings. The L.E. Carpenter site has been historically used for industrial purposes, and will remain so for the foreseeable future. Deed restrictions combined with other institutional controls will be implemented as an integral part of any remedial strategy proposed at the site. Primary chemicals of concern in soils include DEHP, PCBs, and various metals. The proposed non-residential surface standard for DEHP is 210 ppm. The subsurface standard is 100 ppm and applies to those soils defined as vadose zone soils extending from 2 feet BGS to the water table. The subsurface standards assure protection of groundwater from soil contaminants leaching into percolating rainfall. PCBs have numerical non-residential surface and subsurface cleanup standards of 2.0 and 100 ppm, respectively. Surface and subsurface concentrations of inorganics were compared to the numerical cleanup standards for surface soils. Both surface and subsurface chromium concentrations were compared to the former ECRA guidelines of 100 ppm.

During the RI, the L.E. Carpenter soil sampling program was divided into three areas of study based upon the former operations in the different areas (see Figure 4-1). Area I encompasses the southeast portion of the site. Specific zones of interest within Area I include the former tank farm and impoundment area, and the abandoned Rockaway Valley Regional Sewage Authority (RVRSA) sewer line located on Wharton Enterprises property. Area I also includes monitoring well cluster 13 located on the Air Products property. Area II extends roughly from the Rockaway River to the northeast end of Building and 15/17, and from the southward bend of North Main Street to the edge of Area I. Zones of interest within Area II include the railroad ROW and loading docks for various buildings. Area III encompasses much of the remaining



WESTON MANAGERS DESIGNERS/CONSULTANTS

L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY

SOILS INVESTIGATION
AREAS OF INTEREST

FIGURE	DATE	REVISION
4-1	6/10/92	0

FROM ORIGINAL BY GEOENGINEERING

property, including the area between Washington Forge Pond and North Main Street. Specific zones of interest in Area III include various locations where small process and waste tanks were removed in accordance with a NJDEPE approved tank closure plan, a series of on-site transformers, a loading dock for the drum storage building (Building 9), a former surface drainage feature, and the former starch drying beds.

A total of 144 soil samples (including three background soil samples) were collected for analysis during the course of the RI. Table 4-1 lists the soil sample numbers and the corresponding analysis performed on each.

The following discussion summarizes soil sampling and analysis findings by area of study.

4.1.1 Area I - Soils Summary

Area I is approximately bounded by Buildings 12, 13, and 14 and extends northeast along the railroad ROW to the property line, along the northeast property line approximately 300 feet, encompasses the Air Products property near MW-13, extends approximately 500 feet into the Wharton Enterprises property to encompass the abandoned sewer line, and along the Rockaway River to the steel penstock (see Figure 4-2). Shallow soil samples were collected in approximately 26 locations. Deep soil samples were collected from a depth immediately above groundwater (2 to 8 feet BGS) at 63 locations.

DEHP was found at concentrations exceeding 100 ppm at 7 of 26 surface soil samples collected in Area 1 (HA-1, HA-2, HA-3, HA-6, TP83A, TP86B, and TP87B). The three surface soil samples in Area I, which contained PCBs at concentrations above the proposed cleanup standard of 2 ppm (2000 ug/kg), were collected from soils on the western portion of the Wharton Enterprises property. Selected metals, namely antimony and lead, were detected at the southeast perimeter of Building 13 and south of monitoring well MW-9 at concentrations exceeding the proposed non-residential NJDEPE cleanup guidelines.

Analysis of deep soil samples for base neutral compounds indicate DEHP in the subsurface in concentrations exceeding 100 ppm in the area extending from Buildings 13 and 14 in the west to the terminus of the abandoned sewer line in the east, and from the drainage ditch in the north to the Rockaway River in the south. This area includes both the former tank farm and surface impoundment areas. VOC have also been detected in deep soil samples. In general, VOC, namely xylenes, ethylbenzene, and methylene chloride, have been detected in deep soil samples collected in the vicinity of the tank farm trending northeastward. Concentrations of methylene chloride are thought to be contributed by a laboratory contamination since it was also found in blank samples. Elevated concentrations of VOC generally correlate to locations where the highest concentrations of DEHP were detected. In one location, north of monitoring well MW-6, elevated concentrations of lead and antimony were detected.

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TABLE 4-1

SOIL SAMPLE ANALYTICAL PARAMETER SUMMARY

	ANALYTICAL PARAMETERS						
Test Pit Sample #	VOC+15	BN+15	TPH	PP METALS	Pesticides/PCBs	Fingerprint (SBO)	PP+40
TP-1A	X	X		X	X		
TP-1B	X	X		X	X		
TP-2A	X	X		X	X		
TP-2B	X	X		X	X		
TP-3A	X	X		X	X		
TP-3B	X	X		X	X		
TP-4A	X	X		X	X		
TP-4B	X	X		X	X		
TP-5A	X	X		X	X		
TP-5B	X	X		X	X		
TP-6A	X	X		X	X		
TP-6B	X	X		X	X		
TP-7A	X	X		X	X		
TP-7B	X	X		X	X		
TP-8A	X	X		X	X		
TP-8B	X	X		X	X		
TP-9A	X	X		X	X		
TP-9B	X	X		X	X		
TP-10	X	X					
TP-11	X	X					
TP-12	X	X					
TP-13	X	X					
TP-14	X	X					
TP-15	X	X					
TP-16	X	X					
TP-17	X	X					
TP-18	X	X					
TP-19	X	X					
TP-20	X	X					
TP-21	X	X					
TP-22	X	X					
TP-23	X	X					
TP-24	X	X					
TP-25	X	X					
TP-26	X	X					
TP-27	X	X					
TP-28	X	X					
TP-29	X	X					
TP-30							
TP-31						X	
TP-32						X	
TP-33	X					X	
TP-34		X				X	
TP-35		X	X			X	
TP-36		X	X				
TP-37		X					
TP-38		X	X			X	
TP-39	X	X	X				
TP-40			X				

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TABLE 4-1

(CONTINUED)
SOIL SAMPLE ANALYTICAL PARAMETER SUMMARY

	ANALYTICAL PARAMETERS						
Test Pit Sample #	VOC+15	BN+15	TPH	PP METALS	Pesticides/PCBs	Fingerprint (SBO)	PP+40
TP-41		X	X				
TP-42	X	X	X				
TP-43	X	X					
TP-44	X	X				X	
TP-46	X	X				X	
TP-47	X	X				X	
TP-48	X	X				X	
TP-49				X		X	
TP-50A							X
TP-50B							X
TP-51A						X	X
TP-51B							X
TP-52							X
TP-53							X
TP-54							X
TP-55	X	X					
TP-56	X	X					
TP-57	X	X					
TP-58	X	X					
TP-59	X	X					
TP-60	X	X		X			
TP-61	X	X					X
TP-62	X	X					X
TP-63	X	X					X
TP-64	X	X					X
TP-65	X	X					X
TP-66	X	X					X
TP-67	X	X					X
TP-68	X	X					
TP-69	X	X			X		
TP-70	X	X			X		
TP-71	X	X			X		
TP-72	X	X			X		
TP-73	X	X			X		
TP-74	X	X			X		
TP-75	X	X					
TP-76	X						
TP-77	X	X					
TP-78	X	X					
TP-79	X	X					

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TABLE 4-1

(CONTINUED)
SOIL SAMPLE ANALYTICAL PARAMETER SUMMARY

	ANALYTICAL PARAMETERS						
Test Pit Sample #	VOC+10	BN+10	TPH	PP METALS	Pesticides/PCBs	Fingerprint (SBO)	PP+40
TP-80A					X		
TP-80B					X		
TP-80C					X		
TP-81A					X		
TP-81B					X		
TP-81C					X		
TP-82A					X		
TP-82B					X		
TP-82C	(VOC+10)	(BN+10)			X		
TP-83A	X	X			X		
TP-83B	X	X			X		
TP-84A	X	X			X		
TP-84B	X	X			X		
TP-84C	X	X			X		
TP-85A	X	X			X		
TP-85B	X	X			X		
TP-85C	X	X			X		
TP-86A	X	X			X		
TP-86B	X	X			X		
TP-86C	X	X			X		
TP-87A	X	X			X		
TP-87B	X	X			X		
TP-88A	X	X			X		
TP-88B	X	X			X		
TP-89	X	X			X		

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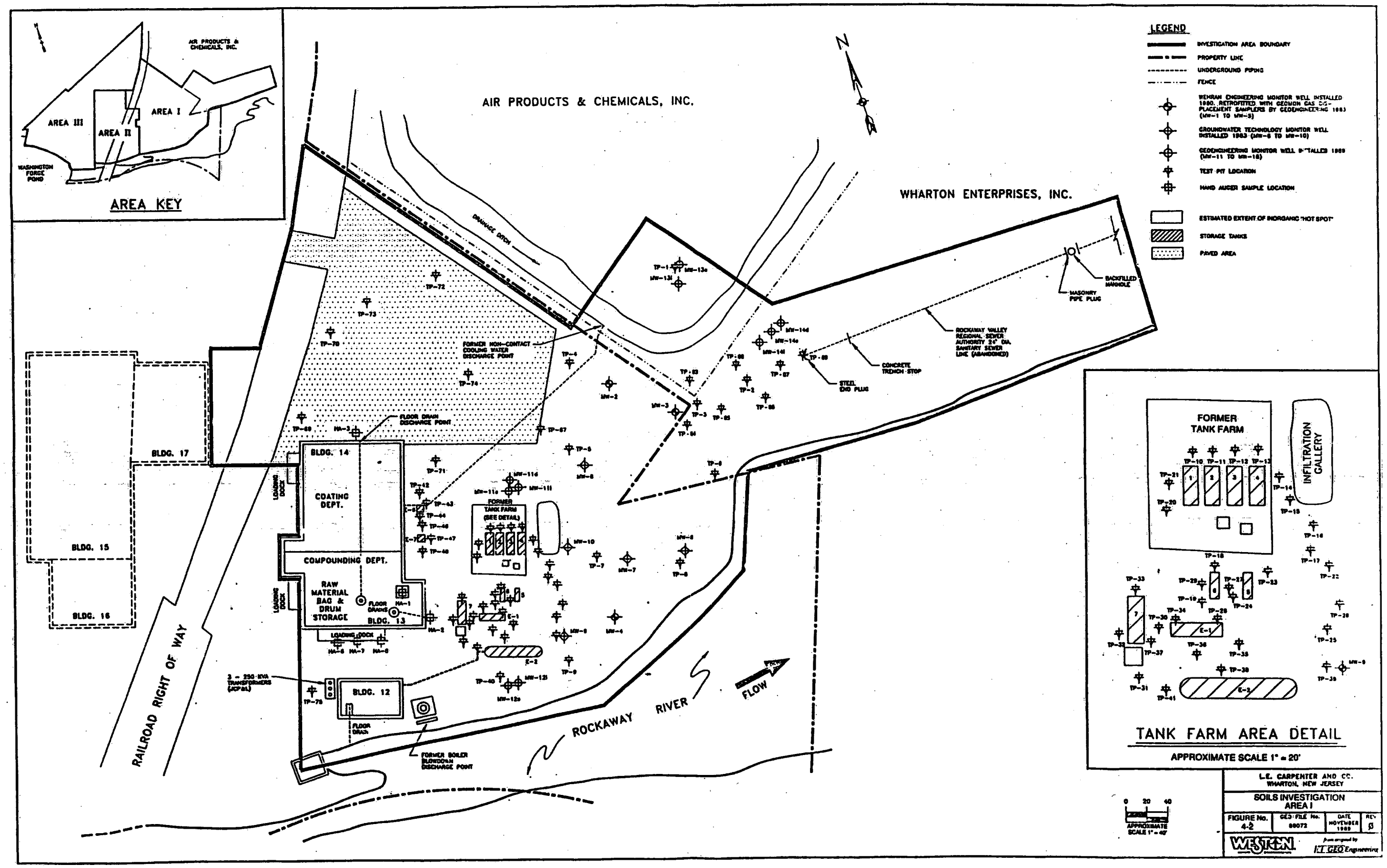
TABLE 4-1

(CONTINUED)
SOIL SAMPLE ANALYTICAL PARAMETER SUMMARY

	ANALYTICAL PARAMETERS							
Hand Auger Sample #	VOC+15	BN+15	TPH	PP METALS	Pesticides/PCBs	Fingerprint (SBO)	VO+10	TAL Metals
HA-1	X	X	X			X		
HA-2	X	X		X				
HA-3	X	X		X				
HA-4	X	X		X				
HA-5	X	X		X				
HA-6	X	X		X				
HA-7	X	X		X				
HA-8	X	X		X				
HA-9	X							
HA-10	X							
HA-11	X							
HA-12	X							
HA-13	X							
HA-14	X							
HA-15	X							
HA-16	X	X		X				
HA-17	X	X		X				
HA-18	X	X		X				
HA-19	X	X		X				
HA-20					X			
HA-21					X			
HA-22					X			
HA-23			X					
HA-24			X					
HA-25			X					
HA-26							X	X
HA-27							X	X
HA-28							X	X

NOTES:
- X = Specified test pit sample analyzed for indicated parameter.
- VOC+15 = Volatile Organic Compounds by EPA Method 8240 plus 15 non-targeted compounds.
- VOC+10 = Volatile Organic Compounds by CLP Statement of Work for Organic Analysis Multi Media, Multi Concentration; 2/28 with Revisions; plus 10 non-targeted compounds.
- BN+15 = Base Neutral Organics by EPA Method 8270 plus 15 non-targeted compounds.
- TPH = Total Petroleum Hydrocarbons by EPA Method 418.1.
- PPMetals = Priority pollutant metals by EPA 200 series or comparable ICP EPA Methods.
- Pesticides/PCBs = Pesticides and polychlorinated biphenyls (PCBs) by EPA Method 8080
- Fingerprint (SBO) = Hydrocarbon Fingerprint by GC/FID using modified ASTM Method D3328 searching for soybean oil
- PP+40 = Priority Pollutants plus forty additional compounds includes; volatiles by EPA Method 8240, Base Neutrals and Acid Extractable Organics by EPA Method 8270, Organochloride Pesticides and PCBs by EPA Method 8080, Priority Pollutant Metals plus Cyanide and Phenol.
- TAL Metals = Target Analyte List Metals by CLP Statement of Work for Inorganic Analysis, Multi Media, Multi Concentration 2/28 with Revisions


AIR PRODUCTS & CHEMICALS, INC.
AREA III
AREA II
AREA I
WASHINGTON FORGE POND
AREA KEY
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
N
DRAINAGE DITCH
FORMER NON-CONTACT COOLING WATER DISCHARGE POINT
FLOOR DRAIN DISCHARGE POINT
BLDG. 17
BLDG. 15
BLDG. 16
BLDG. 14
COATING DEPT.
COMPOUNDING DEPT.
RAW MATERIAL BAG & DRUM STORAGE
BLDG. 13
LOADING DOCK
FORMER TANK FARM (SEE DETAIL)
3 - 250 KVA TRANSFORMERS (ASPLA)
BLDG. 12
FLOOR DRAIN
FORMER BOILER BLOWDOWN DISCHARGE POINT
RAILROAD RIGHT OF WAY
ROCKAWAY RIVER
FLOW
BACKFILLED MANHOLE
MASONRY PIPE PLUG
ROCKAWAY VALLEY REGIONAL SEWER AUTHORITY 24" DIA. SANITARY SEWER LINE (ABANDONED)
CONCRETE TRENCH STOP
STEEL END PLUG
LEGEND
INVESTIGATION AREA BOUNDARY
PROPERTY LINE
UNDERGROUND PIPING
FENCE
WEHRAN ENGINEERING MONITOR WELL INSTALLED 1980. RETROFITTED WITH GEONOR GAS DISPLACEMENT SAMPLERS BY GEOENGINEERING 1983 (MW-1 TO MW-5)
GROUNDWATER TECHNOLOGY MONITOR WELL INSTALLED 1983 (MW-6 TO MW-10)
GEOENGINEERING MONITOR WELL INSTALLED 1989 (MW-11 TO MW-18)
TEST PIT LOCATION
HAND AUGER SAMPLE LOCATION
ESTIMATED EXTENT OF INORGANIC "HOT SPOT"
STORAGE TANKS
PAVED AREA
FORMER TANK FARM
INFILTRATION GALLERY
TANK FARM AREA DETAIL
APPROXIMATE SCALE 1" = 20'
0 20 40
APPROXIMATE SCALE 1" = 40'
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
SOILS INVESTIGATION
AREA I
FIGURE No. 4-2
GEI FILE No. 89072
DATE NOVEMBER 1989
REV 0
WESTON
performed by
I.T. GEO Engineering

4.1.2 Area II - Soils Summary

A total of nine shallow soil samples and four deep soil samples were collected in Area II (see Figure 4-3), which encompasses the western edge of Building 15 to the western edge of Buildings 13 and 14 (east-west) and the northern edge of Building 15 to the Rockaway River. All shallow (hand auger) samples were collected within the top 1.5 feet of soil. The deep (test pit) samples were collected immediately above the water table at depths ranging from 6 feet to 8 feet BGS.

All hand auger samples were analyzed for VOC. These results indicated less than 0.18 ppm total targeted VOC in each sample. In all cases, the major component of VOC detected was methylene chloride. Methylene chloride was also detected in field and laboratory blank samples. Two samples adjacent to the loading dock of former Building 13 indicated the presence of CaPAH at concentrations below the proposed non-residential surface soil cleanup standards. One of these samples also indicated the presence of lead at a concentration greater than 600 ppm.

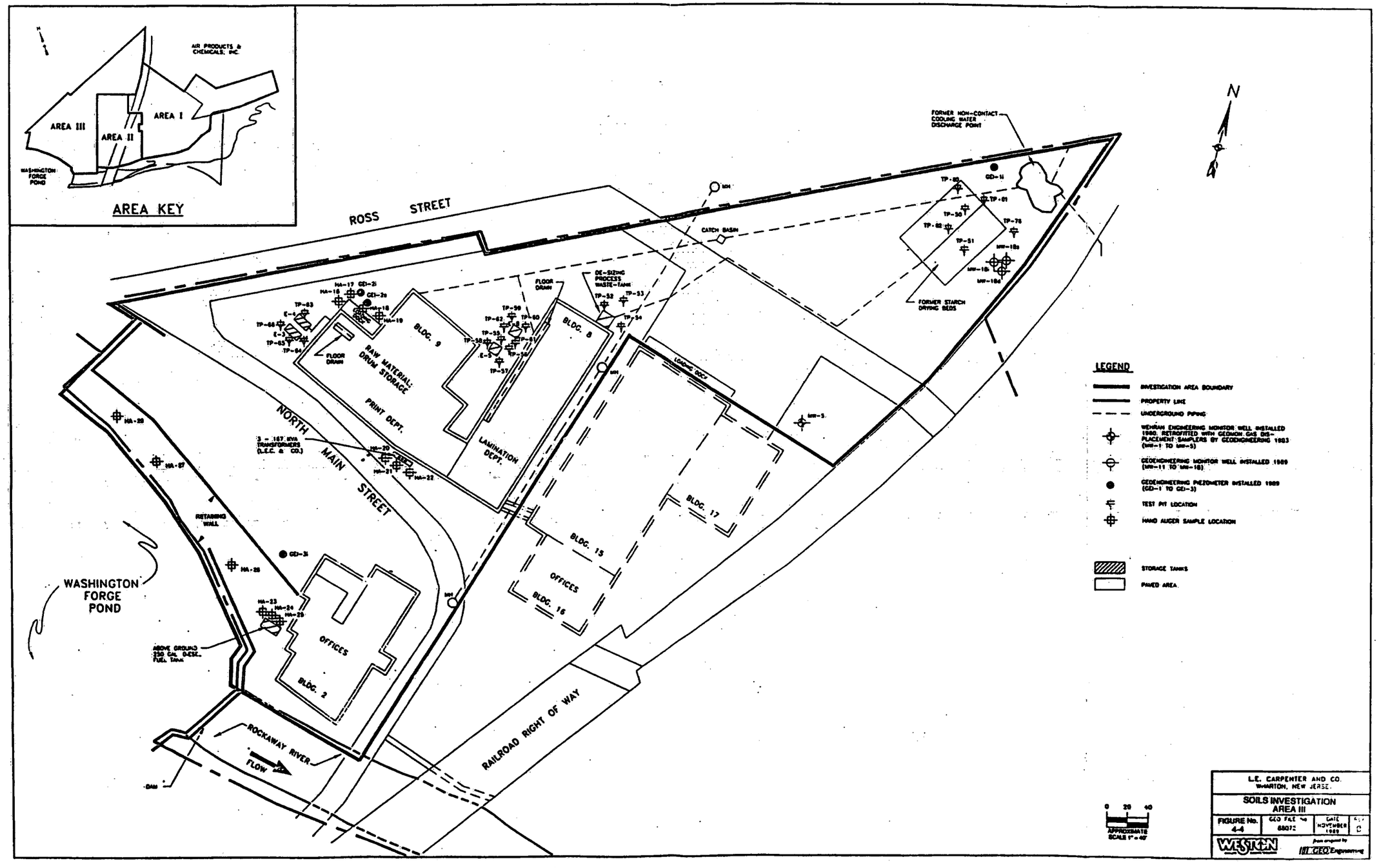
DEHP was not detected above 10 ppm, below the proposed cleanup standard, in any of the four deep soil samples collected from Area II. Targeted VOC were not detected at concentrations exceeding 3 ppb. Metals were analyzed in one deep soil sample and were not found to be present at concentrations above the proposed cleanup standards.

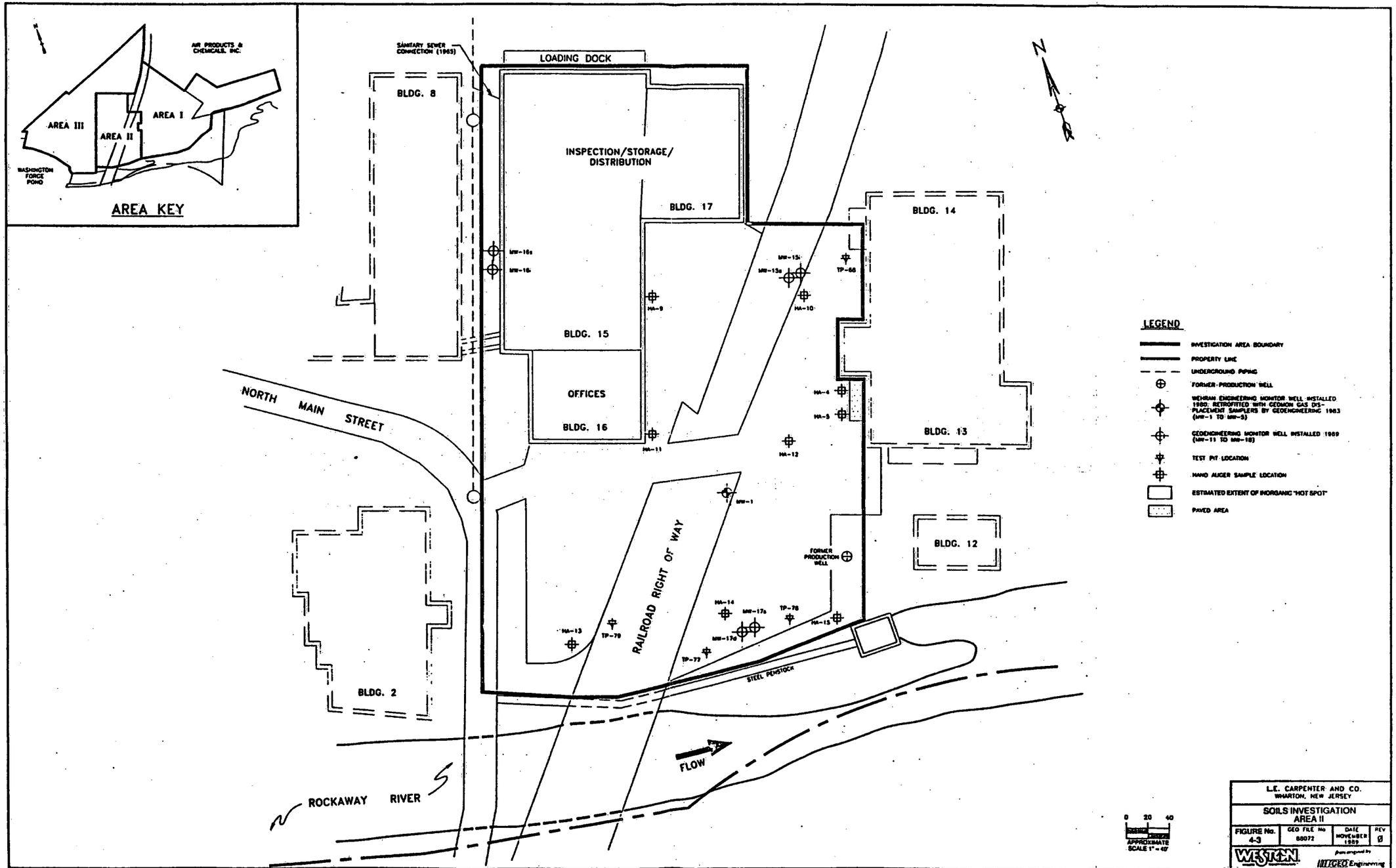
4.1.3 Area III - Soils Summary

A total of 18 shallow and 21 deep soil samples were collected from Area III (see Figure 4-4). Three additional shallow soil samples were collected along Washington Forge Pond to assess background conditions of the fill material comprising the site. None of the samples indicated the presence of metals at concentrations exceeding the proposed cleanup standards.

Three shallow samples were collected west of Building 2, near the aboveground diesel tank, and analyzed for TPHC. Results indicated levels of residual hydrocarbons of less than 3 ppm in all samples. An additional three shallow samples were collected southwest of Building 9 near the three transformers. These samples were analyzed for PCBs, which were not detected. Four shallow soil samples were collected adjacent to the loading dock at Building 9. DEHP and PCBs were not detected at concentrations exceeding NJDEPE proposed cleanup standards. Antimony was detected at a concentration exceeding the NJDEPE proposed cleanup standards for non-residential surface soils at one (1) of these locations (HA-19).

The remaining eight (8) shallow soil samples were collected in the vicinity of the former starch drying beds. These samples were collected at depths shallower than 2 feet and indicated the presence of PCBs at concentrations ranging from nondetectable to 2.9 ppm. Base neutral compounds (BN), including DEHP and inorganic compounds, were not detected at concentrations greater than the proposed cleanup standards.


AREA KEY
AIR PRODUCTS & CHEMICALS, INC.
AREA III
AREA II
AREA I
WASHINGTON FORGE POND
ROSS STREET
FORMER NON-CONTACT COOLING WATER DISCHARGE POINT
CATCH BASIN
FORMER STARCH DRYING BEDS
DE-SIZING PROCESS WASTE TANK
FLOOR DRAIN
BLDG. 9
BLDG. 8
RAW MATERIAL DRUM STORAGE
PRINT DEPT.
LAMINATION DEPT.
LOADING DOCK
NORTH MAIN STREET
3 - 167 KVA TRANSFORMERS (L.E.C. & CO.)
RETAINING WALL
OFFICES
BLDG. 2
BLDG. 15
BLDG. 16
BLDG. 17
ABOVE GROUND 250 GAL. DIESEL FUEL TANK
ROCKAWAY RIVER
FLOW
DAM
RAILROAD RIGHT OF WAY
N
LEGEND
INVESTIGATION AREA BOUNDARY
PROPERTY LINE
UNDERGROUND PIPING
WEHRAN ENGINEERING MONITOR WELL INSTALLED 1980, RETROFITTED WITH GEOMON GAS DISPLACEMENT SAMPLERS BY GEOENGINEERING 1983 (MW-1 TO MW-5)
GEOENGINEERING MONITOR WELL INSTALLED 1989 (MW-11 TO MW-18)
GEOENGINEERING PIEZOMETER INSTALLED 1989 (GEI-1 TO GEI-3)
TEST PIT LOCATION
HAND AUGER SAMPLE LOCATION
STORAGE TANKS
PAVED AREA
0 20 40
APPROXIMATE SCALE 1" = 40'
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
SOILS INVESTIGATION
AREA III
FIGURE No. 4-4
GEO FILE No. 88072
DATE NOVEMBER 1989
WESTON
GEO Engineering


AREA KEY
AIR PRODUCTS & CHEMICALS, INC.
AREA III
AREA II
AREA I
WASHINGTON FORCE POND
SANITARY SEWER CONNECTION (1963)
LOADING DOCK
BLDG. 8
INSPECTION/STORAGE/ DISTRIBUTION
BLDG. 17
BLDG. 14
BLDG. 15
OFFICES
BLDG. 16
BLDG. 13
BLDG. 12
BLDG. 2
NORTH MAIN STREET
RAILROAD RIGHT OF WAY
STEEL PENSTOCK
FORMER PRODUCTION WELL
MW-16a
MW-16
MW-15
MW-15a
TP-66
HA-9
HA-10
HA-4
HA-5
HA-11
HA-12
MW-1
HA-13
TP-79
HA-14
MW-17a
MW-17c
TP-78
HA-15
TP-77
FLOW
ROCKAWAY RIVER
LEGEND
INVESTIGATION AREA BOUNDARY
PROPERTY LINE
UNDERGROUND PIPING
FORMER PRODUCTION WELL
WEHRAN ENGINEERING MONITOR WELL INSTALLED 1980; RETROFITTED WITH GEOMON GAS DISPLACEMENT SAMPLERS BY GEOENGINEERING 1983 (MW-1 TO MW-5)
GEOENGINEERING MONITOR WELL INSTALLED 1989 (MW-11 TO MW-18)
TEST PIT LOCATION
HAND AUGER SAMPLE LOCATION
ESTIMATED EXTENT OF INORGANIC "HOT SPOT"
PAVED AREA
0 20 40
APPROXIMATE SCALE 1" = 40'
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
SOILS INVESTIGATION
AREA II
FIGURE No. 4-3
GEO FILE No. 88072
DATE NOVEMBER 1989
REV 0
WESTON
from original by
GEOENGINEERING

Six (6) deep samples were also collected in the vicinity of the former starch drying beds at depths corresponding to shallow groundwater (2.5 to 4.0 feet). Analysis of these samples indicate that PCBs are not present in subsurface soils at concentrations greater than 0.6 ppm. DEHP, CaPAHs, and various inorganics were found to be present at concentrations below applicable cleanup goals.

Eight (8) subsurface soil samples were collected at depths ranging from 4.5 to 6.0 feet from an area immediately west of Building 8 in the vicinity of the former tanks E5 and E8. These samples were analyzed for BN compounds and indicated the presence of DEHP at concentrations up to 6,200 ppm. Several other BN compounds were also detected in these samples. Four (4) post excavation samples were collected as an integral part of the approved Tank Closure Plan. These samples were collected from depths ranging 3.5 to 5 feet BGS and analyzed for VOC. Acetone and methylene chloride were detected in all samples including field blanks. Comparison of sample concentrations to concentrations detected in blanks indicates the presence of these compounds in field samples are due to laboratory contamination. Limited VOC (namely toluene, ethylbenzene, and xylenes) were also detected in these samples but at concentrations below regulatory concern (maximum total VOC of 0.13 ppm).

Three (3) subsurface samples (TP-52 through TP-54) were collected from the vicinity of the former desizing process tank to the northeast of Building 8. These samples were analyzed for VOC, BN, and inorganic parameters and did not indicate the presence of contaminants at concentrations above soil cleanup standards.

Four (4) deep soil samples (TP-63 through TP-66) were collected immediately west of Building 9 in the vicinity of former tanks E3 and E4. Analysis of these samples indicated that VOC are not present in the soils in this area. Analysis of six (6) tank closure post-excavation samples collected immediately following removal of tanks E3 and E4 did not reveal any VOC at TP-63; DEHP was detected at a concentration exceeding 100 ppm.

Three (3) background soil samples (HA-26, HA-27, and HA-28) were collected adjacent to Washington Forge Pond outside of known areas of past process or disposal activities at the L.E. Carpenter facility. These samples were collected from one foot below grade and analyzed to evaluate the background (non site-related) conditions of the fill which comprises the majority of surface soils throughout the L.E. Carpenter site. Analytical results for these samples are reported in the Report of Supplemental Remedial Investigation, Volume I. VOC results indicate the presence of low concentrations (to 0.1 ppm) of total VOC, primarily methylene chloride and acetone. These compounds were also detected in quality control samples and, therefore, represent laboratory contamination. Arsenic, selenium, and lead were detected in sample HA-28 at concentrations greater than proposed residential cleanup standards for surface soils. This indicates that some residual metals concentrations detected on-site may be the result of contributions from either natural conditions, original fill conditions, or anthropogenic sources.

4.2 Sediment Sampling Results

The following section presents and summarizes results of sediment sampling that has occurred as part of the supplemental investigation as well as previous sediment sampling which occurred during the RI. Sediment sampling results may be located in the Revised Report of Remedial Investigation Findings, Volume II - Data Tables (#22, 24, 26), the Report of Supplemental Remedial Investigation, Volume I, and Additional Sediment Sampling Results: Supplemental Remedial Investigation Sampling, April 8, 1991. Table 4-2 summarizes the sediment sampling activity conducted to date. Table 4-3 summarizes all concentrations and parameters which were detected in the sediment samples. Figure 4-5 depicts the locations where sediment samples were collected. For discussion purposes, downstream concentrations of compounds detected in sediment samples were compared to three times the average concentration detected in site specific background samples.

4.2.1 Background Sediment Sampling

Background samples discussed in this section are defined as samples that were collected from areas upstream of L.E. Carpenter source areas.

One (1) background sediment sample (SS-1) was collected in 1989 from Washington Forge Pond. Analysis of this sample included priority pollutant metals, VOC, and BN compounds. Two (2) background sediment samples (SS-2-4 and SS-2-5) were collected in 1991 and were analyzed for BN compounds and select metals (antimony, copper, lead, mercury). Locations of the 1991 samples were selected with input from representatives of the NJDEPE present at the time of sampling.

In addition, two (2) background sediment samples were collected by the United States Geological Survey (USGS) from portions of the Rockaway River upgradient from Washington Forge Pond. The samples were collected approximately one and four miles upstream of the L.E. Carpenter site. These samples were analyzed for various metals and organochlorine compounds. The analytical results from these samples are presented in the paper "Trace-Metal and Organochlorine Residues in Sediments of the Upper Rockaway River, New Jersey" Smith, Harte, and Hardy, 1987, and are included in this discussion of background samples.

Base neutral analysis of the three background samples collected as part of the RI and SRI indicated several PAH compounds and phthalates in the upgradient samples collected, namely, phenanthrene, pyrene, fluoranthene, and DEHP. Total BN concentrations in these samples ranged from 1.5 to 20 ppm. Possible sources for PAH compounds include the railroad spur and trestle and historical use of coal as a fuel source for industrial/manufacturing facilities in the immediate area.

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TABLE 4-2

SEDIMENT SAMPLING ACTIVITIES AT THE L.E. CARPENTER SITE, WHARTON, NEW JERSEY

SEDIMENT SAMPLE	DATE COLLECTED	LOCATION	PARAMETERS ANALYZED
SS-1	3/14/89	In Washington Forge Pond	VOC+15, BN+15, PPM
SS-2	3/14/89	At Steel Penstock outflow	VOC+15, BN+15, PPM
SS-3	3/14/89	Approximately 75' ENE of MW8	VOC+15, BN+15, PPM
SS-4	3/14/89	In former infiltration pond	VOC+15, BN+15, PPM
SS-5	8/2/89	Adjacent to former non-contact cooling water discharge point	VOC+15, BN+15, PPM
SS-6	3/14/89	In former surface drainage feature Area III	VOC+15, BN+15, PPM
SS-7	8/27/90	Adjacent to former starch drying beds	VOC+10, BN+10, PCB
SS-8	8/27/90	Ditch bend at northern point of Wharton Enterprises property	VOC+10
SS-9	8/28/90	Junction of drainage ditch and Rockaway River	VOC+10, BN+10, PCB
SS-10	8/28/91	Approximately 50' SSE of MW4	VO+10, TAL
SS-2-1	4/8/91	Along river bank, approximately 100' SW at SS-3	BN+10, TOC, Sb, Cu, Pb, Hg, GS
SS-2-2	4/8/91	Along river bank, approximately 100' NE of SS-10	BN+10, TOC, Sb, Cu, Pb, Hg, GS
SS-2-3	4/8/91	Along river bank, approximately 40' SSW of MW12	BN+10, TOC, Sb, Cu, Pb, Hg, GS
SS-2-4	4/8/91	Immediately east of RR right-of-way	BN+10, TOC, Sb, Cu, Pb, Hg, GS
SS-2-5	4/8/91	Immediately west of RR right-of-way	BN+10, TOC, Sb, Cu, Pb, Hg, GS
SS-2-6	4/8/91	Approximate mid-point between SS-3 and SS-9	BN+10, TOC, Sb, Cu, Pb, Hg, GS
SS-10R	4/8/91	Same location as SS-10	BN+10, PCB

VOC+10, VOC+15 - Volatile Organic Compounds Plus Ten (or Fifteen) Volatiles
BN+10, BN+15 = Base Neutrals Plus Ten (or Fifteen) Semivolatiles
PPM = Priority Pollutant Metals
PCB = Polychlorinated Biphenyls
TAL = Target Analyte List Metals
TOC = Total Organic Carbon
Sb = Antimony
Cu = Copper
Pb = Lead
Hg = Mercury
GS = Grain Size

TABLE 4-3

SEDIMENT SAMPLING RESULTS

PARAMETER	Background			Drainage Ditch					Rockaway River								Gallery
	SS-1	SS-2-4	SS-2-5	SS-5	SS-6	SS-7	SS-7 DUP	SS-8	SS-2	SS-3	SS-9	SS-10	SS-10R	SS-2-1	SS-2-2	SS-2-3	SS-2-6	SS-4
Volatile Organic Compounds (mg/kg)																		
Methylene Chloride		NA	NA	0.029J	0.024JB	0.049JB	0.046JB	0.025JB	0.059J	0.039JB	0.066JB	0.029JB	NA	NA	NA	NA	NA	0.043JB
Tetrachloroethene		NA	NA								0.005J		NA	NA	NA	NA	NA	
Toluene	0.0033J	NA	NA								0.003J		NA	NA	NA	NA	NA	
Chlorobenzene		NA	NA		0.025								NA	NA	NA	NA	NA	
Ethylbenzene		NA	NA	0.017									NA	NA	NA	NA	NA	
Total Xylenes		NA	NA	0.22							0.003J		NA	NA	NA	NA	NA	
Acetone		NA	NA			0.058JB	0.077JB	0.058JB			0.240JB	0.047JB	NA	NA	NA	NA	NA	
2-Butanone (MEK)		NA	NA								0.053		NA	NA	NA	NA	NA	
TOTAL TARGETED VOLATILES	0.0033	NA	NA	0.266	0.049	0.107	0.123	0.083	0.059	0.039	0.370	0.076	NA	NA	NA	NA	NA	0.043
Inorganics (mg/kg)																		
Antimony		8.5	12			NA	NA	NA		64.3	NA	718	NA	0.5	1.0	430	19	9.5
Arsenic	4.9	NA	NA	14	25.7	NA	NA	NA	8	5.2	NA	6.4J	NA	NA	NA	NA	NA	5.6
Beryllium	0.39	NA	NA	0.8	0.39	NA	NA	NA		0.35	NA	1.5J	NA	NA	NA	NA	NA	0.65
Cadmium		NA	NA	2.1	3.0	NA	NA	NA	5.0		NA	2.5J	NA	NA	NA	NA	NA	1.5
Chromium	9.9	NA	NA	27	34.7	NA	NA	NA	33.7	24.7	NA	61.0	NA	NA	NA	NA	NA	25.1
Copper	30.4	17	17	56	69	NA	NA	NA	87.5	36.3	NA	711	NA	310	12	230	35	27.6
Lead	65.4	40	66	156	503	NA	NA	NA	655	199	NA	339	NA	150	41	270	130	67.6
Mercury		0.16	0.1	11	21	NA	NA	NA	2.5	0.5	NA	0.09J	NA	0.1	0.1	0.51	0.29	0.3
Nickel	6.5	NA	NA	19	18.3	NA	NA	NA	18.9	17.1	NA	29.0J	NA	NA	NA	NA	NA	15.2
Selenium	0.7	NA	NA		0.35	NA	NA	NA	0.93	0.39	NA	0.57J	NA	NA	NA	NA	NA	
Silver		NA	NA			NA	NA	NA			NA		NA	NA	NA	NA	NA	
Thallium		NA	NA			NA	NA	NA			NA		NA	NA	NA	NA	NA	
Zinc	46.3	NA	NA	282	336	NA	NA	NA	547	228	NA	250	NA	NA	NA	NA	NA	74.2
PCBs (mg/kg)																		
Arochlor - 1254	NA	NA	NA	NA	NA	0.036J		NA	NA	NA		NA	NA	NA	NA	NA	NA	

TABLE 4-3 (CONTINUED)
SEDIMENT SAMPLING RESULTS

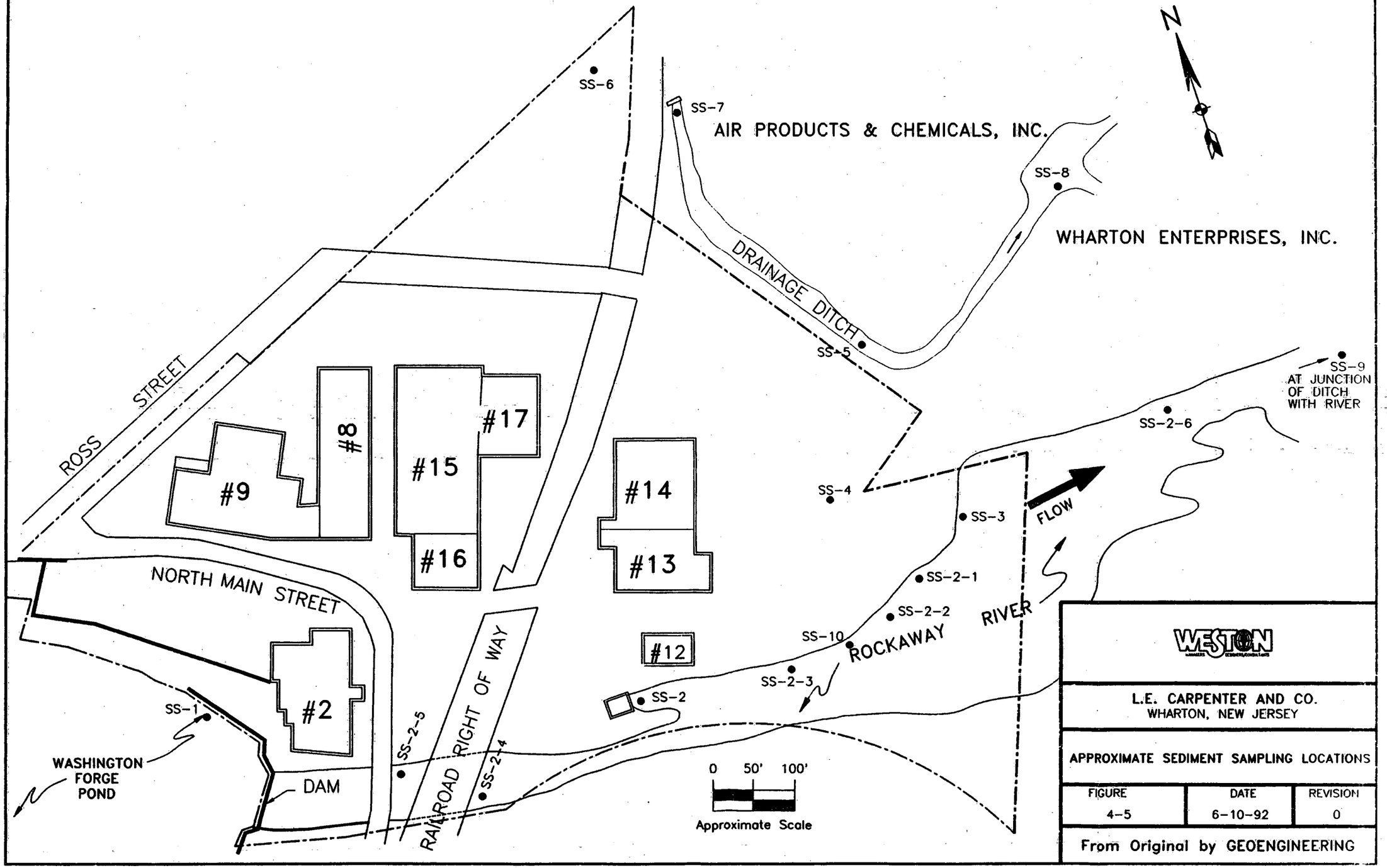
PARAMETER	Background			Drainage Ditch					Rockaway River									Gallery
	SS-1	SS-2-4	SS-2-5	SS-5	SS-6	SS-7	SS-7 DUP	SS-8	SS-2	SS-3	SS-9	SS-10	SS-10R	SS-2-1	SS-2-2	SS-2-3	SS-2-6	SS-4
Base Neutral Compounds (mg/kg)																		
Napthalene	0.20J					0.074J	0.650J	NA	0.31J	0.69J		NA						
Acenaphthylene								NA	0.49J			NA						
Acenaphthene			0.250				0.260J	NA	0.43J	1.30J		NA					0.31	
Fluorene							0.280J	NA	0.61J	1.30J		NA					0.60	
Phenanthrene	0.600J		2.50	1.80	1.0	0.370J	2.6	NA	4.90	10.0	0.09J	NA				2.9	7.00	
Anthracene	0.140J		0.580	0.490J		0.056J	0.450J	NA	1.20J	2.60		NA				0.75	1.20	
Di-n-butyl phthalate	0.680J			0.380J	1.80JB	0.058J	0.380J	NA		2.30JB	0.041J	NA						0.38
Fluoranthene	0.800J	0.500	3.10	4.0	2.80J	0.32J	3.50	NA	5.20	14.0	0.170J	NA				2.9	8.10	
Pyrene	0.70J	0.61	3.00	3.50	2.80J	0.36J	2.60	NA	6.10	11.0	0.073J	NA				3.30	13.0	
Butyl benzyl phthalate					0.92J			NA	0.920J			NA						
Benzo(a)anthracene	0.38J		1.60	1.60	1.50	0.27J	1.40J	NA	3.10	6.40	0.071J	NA				1.60	5.40	
Bis(2-ethylhexyl)phthalate	1.10J		3.30	520.0	74.0	0.69JB	2.30JB	NA	55.0	54.0	2.60JB	NA	1.60			25.0	76.0	22.0
Chrysene	0.56J		1.70	2.50J	1.80J	0.094J	2.0J	NA	4.30	6.50	0.094J	NA				1.70	5.60	
Di-n-octyl phthalate								NA				NA					0.84	
Benzo(b)fluoranthene	0.54JL		1.20	3.80L	2.30JL	0.20J	1.10J	NA	6.40L	8.20L	0.053J	NA				1.20	3.30	
Benzo(k)fluoranthene	0.54JL		1.00	3.80L	2.30L	0.21J	1.40J	NA	6.40L	8.20L	0.071J	NA				1.20	4.50	
Benzo(a)pyrene	0.30J		1.30	1.50J	1.20J	0.21J	1.10J	NA	2.90J	4.70	0.058J	NA				1.30	5.00	
Indeno (1,2,3-c,d)pyrene			0.47	0.55J	0.95J	0.19J	1.90J	NA	1.50J	2.50J	0.048J	NA					2.30	
Di-benzo(a,h)anthracene				0.71J	0.95J	0.064J	0.78J	NA	1.70J	3.30J		NA						
Benzo(g,h,i)perylene						0.26J	2.30	NA			0.055J	NA						
Dibenzofuran			0.086					NA				NA						
2-Methylnapthalene								NA				NA					0.20	
TOTAL TARGETED SEMI-VOLATILES	6.54	1.54	20.09	543.92	92.45	3.362	24.20	NA	99.76	133.69	3.42	NA	1.60			41.85	133.40	22.38

NOTES:
J = Detected below reporting limit or is an estimated concentration.
B = Compound also detected in the laboratory method blank, concentration in this sample is at least 5 times greater than concentrations found in laboratory method blank.
L = Components are not separable using this method and are therefore quantified together.
NA = Not analyzed
Blank indicates not detected.

LEGEND

PROPERTY LINE

SEDIMENT SAMPLING LOCATION



WESTON

L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY

APPROXIMATE SEDIMENT SAMPLING LOCATIONS

FIGURE	DATE	REVISION
4-5	6-10-92	0

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FILE NO. SEDSAMP

The samples analyzed by USGS were collected from areas which drain primarily forested areas; therefore, anthropogenic effects are expected to be minimal. In the two samples collected upgradient of the L.E. Carpenter facility, the average arsenic concentration was 16 ppm, average chromium concentration was 230 ppm, average lead concentration was 50 ppm, and average zinc concentration was 120 ppm. The concentration of zinc detected in the sample collected from Washington Forge Pond was 46.3 ppm.

Site specific background samples were consistent in concentration with the USGS background samples for cadmium, copper, lead, and mercury. Concentrations of arsenic, chromium, nickel and zinc were lower in site specific background samples than those collected upriver. The USGS study did not analyze for antimony, beryllium, selenium, silver, or thallium. However, silver and thallium were not detected in any site sediment samples.

Arsenic, beryllium, chromium, copper, lead, nickel, selenium, and zinc were detected in the sediment sample collected from Washington Forge Pond. Metals concentrations in upgradient samples tended to be lower than concentrations of metals in specific samples collected adjacent to the L.E. Carpenter source areas. This may, however, be indicative of the historical mining operations at the L.E. Carpenter site as well as past manufacturing operations.

4.2.2 Air Products Drainage Ditch Sediments

Three (3) samples (SS-5, SS-7, and SS-8) were collected from the sediments in the Air Products drainage ditch. Sample SS-6 was collected from a surface drainage feature which incorporated the former non-contact cooling water discharge point and drained into the drainage ditch. An additional sediment sample (SS-9) was collected in the Rockaway River at the outfall from the ditch. The purpose of SS-9 was to determine the potential impact of sediment transport from the ditch to the river. The analytical results for sample SS-9 are included in this discussion.

Total VOC were detected in the four (4) drainage ditch sediment samples at concentrations less than 0.3 ppm. Total VOC detected in SS-9 was 0.37 ppm. Concentrations of base neutral compounds (544 ppm) were detected in SS-5 located at the "bend" of the drainage ditch separating Air Products from the L.E. Carpenter site. These concentrations decreased by two orders of magnitude in SS-9. This would indicate that base-neutral laden sediments are not being transported from the ditch to the river. PCBs were not analyzed for in drainage ditch sediments. However, analysis of SS-9 did not detect PCBs.

Elevated concentrations (greater than three times average background concentrations) of arsenic, chromium, copper, lead, mercury, and zinc were detected in sediments from the surface drainage feature (SS-6). Further downgradient in the ditch (SS-5), concentrations were reduced such that only mercury and zinc were elevated. The samples collected from the ditch at SS-8 and the confluence of the ditch with the river (SS-9) were not analyzed for metals. However, comparison of metals results from SS-6 and SS-5 would indicate that all metals except mercury

and zinc would not be found downstream at concentrations greater than three times background. The source of those elevated concentrations could be historical deposition of contaminants from discharge points and recent leaching of shallow groundwater into the ditch. It does not appear, however, that contaminants are being mobilized and transported downgradient in the ditch or into the river.

4.2.3 Rockaway River Sediments

A total of ten (10) sediment samples were collected from sediments of the Rockaway River adjacent to and downgradient of L.E. Carpenter. This includes SS-9, which was discussed in subsection 4.2.2. This total also includes two (2) samples (SS-2-4 and SS-2-5) collected from an area believed to be upstream of the former source areas on-site.

Analytical results indicate less than 0.5 ppm total concentrations of VOC in all Rockaway River sediment samples. Elevated concentrations are limited to sediments located west of MW-12 and east of MW-8. Further downstream, as evidenced by sample SS-9, the concentrations of BN compounds drop off to concentrations similar to upstream (SS-1) conditions. The locations which indicate the highest concentrations of metals and BN compounds are SS-3 and SS-2-6.

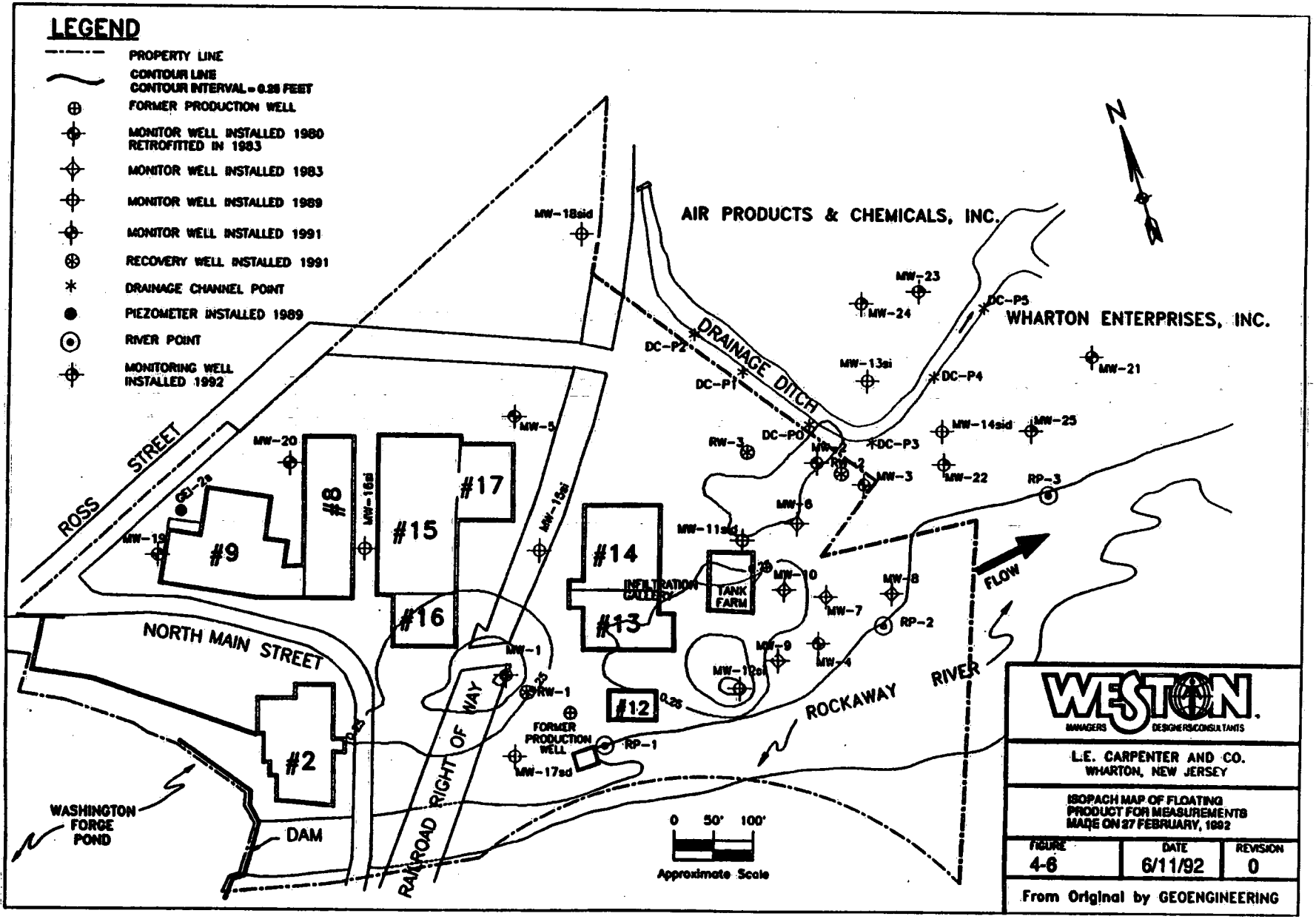
Elevated concentrations of inorganic parameters, namely lead, copper, and antimony, also seem to be limited to sediments located west of sampling station SS-10 and east of station SS-3. The highest concentrations of metals in sediments were located immediately south of the former tank farm trending westward toward the steel penstock discharge point. With the exception of antimony in two sampling locations (SS-10 and SS-2-3) and copper and lead in one location each (SS-10 and SS-2, respectively), all concentrations of metals in sediments were below the proposed soil cleanup standards.

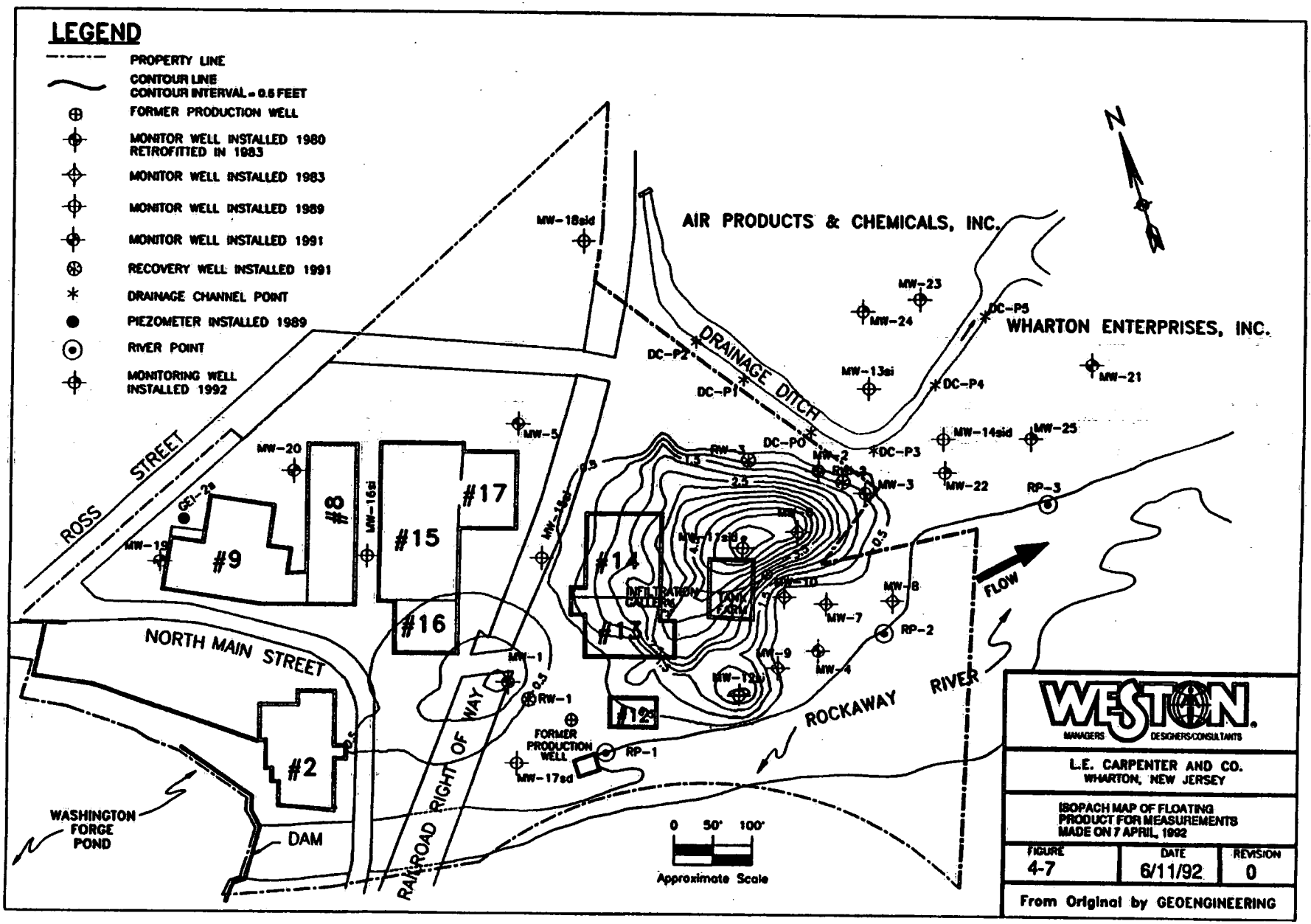
4.3 Groundwater

The following discussion presents a summary of current conditions on-site with respect to areal extent of immiscible product and groundwater contamination. Section 4.3.1 will present recent findings as it relates to the floating product and 4.3.2 will discuss the extent of groundwater contamination in the shallow zone.

4.3.1 Extent of Immiscible Product

Product thickness measurements acquired on 27 February and 7 April 1992 are presented in Tables 3-1 and 3-2. This product thickness data were used in the development of the product thickness isopach maps presented in Figures 4-6 and 4-7. Figure 4-7, which was generated from data acquired while the EIPRS was down for maintenance, depicts a significant thickness of product centered on MW-11S and extending southward to MW-12S. Figure 4-6, which was generated from data acquired while the EIPRS was in operation, shows that the thickness of the


LEGEND
PROPERTY LINE
CONTOUR LINE
CONTOUR INTERVAL = 0.25 FEET
FORMER PRODUCTION WELL
MONITOR WELL INSTALLED 1980 RETROFITTED IN 1983
MONITOR WELL INSTALLED 1983
MONITOR WELL INSTALLED 1989
MONITOR WELL INSTALLED 1991
RECOVERY WELL INSTALLED 1991
DRAINAGE CHANNEL POINT
PIEZOMETER INSTALLED 1989
RIVER POINT
MONITORING WELL INSTALLED 1992
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
DRAINAGE DITCH
ROSS STREET
NORTH MAIN STREET
RAILROAD RIGHT OF WAY
ROCKAWAY RIVER
FLOW
INFILTRATION GALLERY
TANK FARM
FORMER PRODUCTION WELL
WASHINGTON FORGE POND
DAM
#2
#8
#9
#12
#13
#14
#15
#16
#17
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10
MW-11sd
MW-12si
MW-13si
MW-14sid
MW-15si
MW-16si
MW-17sd
MW-18sid
MW-19
MW-20
MW-21
MW-22
MW-23
MW-24
MW-25
RW-1
RW-2
RW-3
RP-1
RP-2
RP-3
DC-P1
DC-P2
DC-P3
DC-P4
DC-P5
DC-PO
0 50' 100'
Approximate Scale
WESTON
MANAGERS DESIGNERS/CONSULTANTS
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
ISOPACH MAP OF FLOATING PRODUCT FOR MEASUREMENTS MADE ON 27 FEBRUARY, 1992
FIGURE 4-6
DATE 6/11/92
REVISION 0
From Original by GEOENGINEERING


LEGEND
PROPERTY LINE
CONTOUR LINE
CONTOUR INTERVAL = 0.5 FEET
FORMER PRODUCTION WELL
MONITOR WELL INSTALLED 1980 RETROFITTED IN 1983
MONITOR WELL INSTALLED 1983
MONITOR WELL INSTALLED 1989
MONITOR WELL INSTALLED 1991
RECOVERY WELL INSTALLED 1991
DRAINAGE CHANNEL POINT
PIEZOMETER INSTALLED 1989
RIVER POINT
MONITORING WELL INSTALLED 1992
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
DRAINAGE DITCH
ROSS STREET
NORTH MAIN STREET
RAILROAD RIGHT OF WAY
ROCKAWAY RIVER
FLOW
WASHINGTON FORGE POND
DAM
FORMER PRODUCTION WELL
INFILTRATION GALLERY
TANK FARM
#2
#8
#9
#12
#13
#14
#15
#16
#17
MW-1
MW-2
MW-3
MW-4
MW-5
MW-7
MW-8
MW-9
MW-10
MW-12d
MW-13si
MW-14sid
MW-16si
MW-17sd
MW-17sid
MW-18sid
MW-19
MW-20
MW-21
MW-22
MW-23
MW-24
MW-25
RW-1
RW-2
RW-3
RP-1
RP-2
RP-3
DC-P1
DC-P2
DC-P3
DC-P4
DC-P5
DC-PO
GEI-2
0.5
1.5
2.5
0 50' 100'
Approximate Scale
N
WESTON
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WHARTON, NEW JERSEY
ISOPACH MAP OF FLOATING PRODUCT FOR MEASUREMENTS MADE ON 7 APRIL, 1992
FIGURE 4-7
DATE 6/11/92
REVISION 0
From Original by GEOENGINEERING

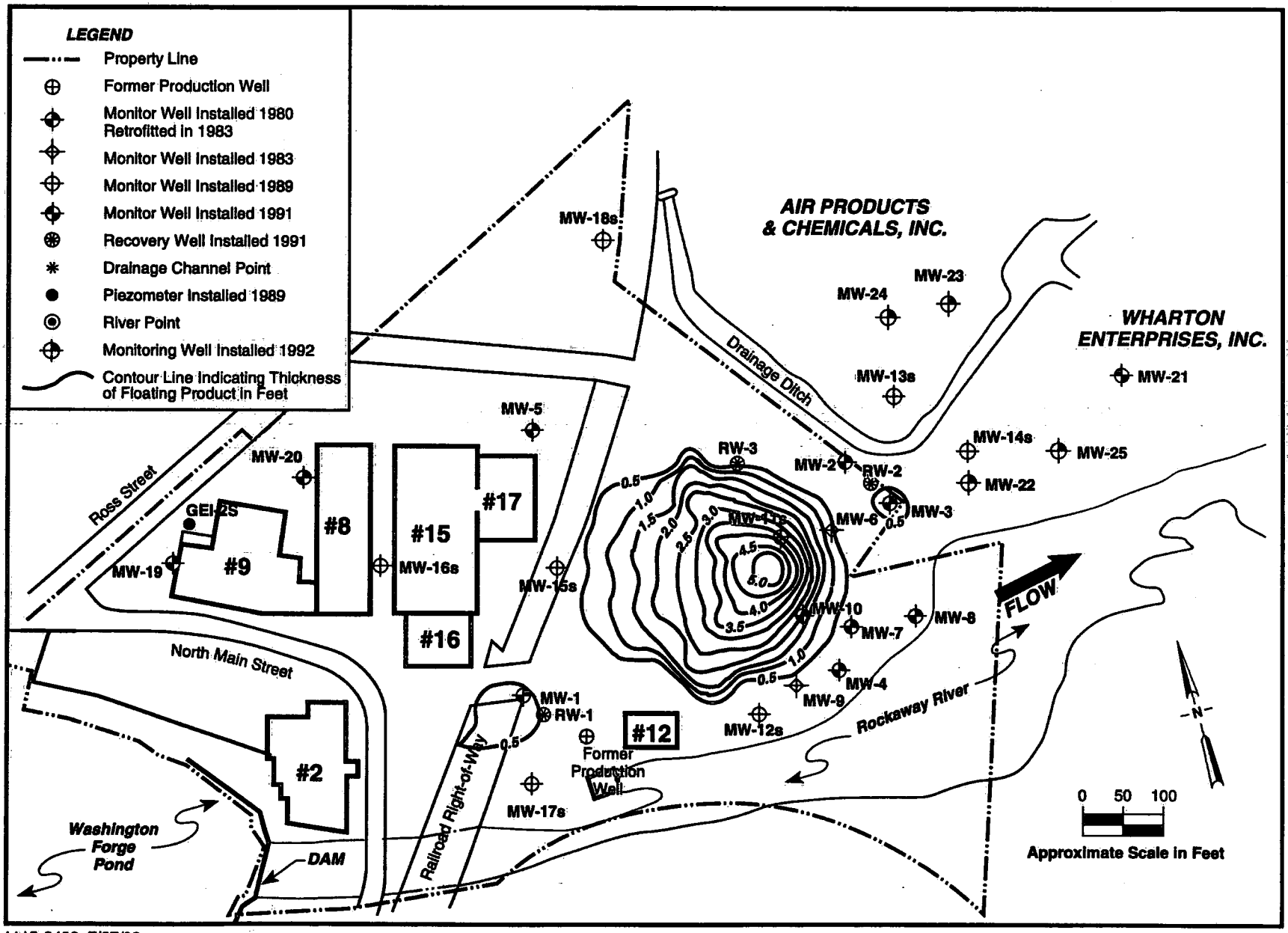
floating product layer has been significantly reduced by the operation of skimmer pumps in MW-6, MW-10, and MW-11S. These maps suggest that the operation of EIPRS has a dramatic affect on the thickness of floating product at the site.

The mean product thickness measurements for 1991 are depicted in Figure 4-8. This pattern is similar to those presented in Figures 4-6 and 4-7. It shows a lens of floating product centered on MW-11S and smaller isolated lenses at MW-1 and MW-3. The observed variations in extent and thickness of the floating product layer are directly related to seasonal variations in infiltration and water table elevation as well as to the operation of the EIPRS system. The overall floating product distribution pattern is generally consistent over time.

Figures 4-6 through 4-8 were contoured using a mathematical technique known as krigging. The fact that the data points (i.e., the shallow monitoring wells) are irregularly spaced results in some differences between the mathematically generated contour patterns and the actual site conditions. For example, data from MW-1 and RW-1 (see Tables 3-1 and 3-2), which are closely spaced (see Figure 4-6), indicate that the floating product is tightly confined in the area between MW-1 and RW-1. The nearest zero (0) value data points to the northeast and northwest of MW-1 are MW-15S and MW-16S. These wells are located 200 and 250 feet, respectively, from MW-1. Because of this spacing, the krigging process extends the minimum contour line out to locations which are essentially equidistant between MW-1, MW-15S, and MW-16S. The overall effect is to exaggerate the aerial extent of the floating product. Therefore, Figures 4-6, 4-7, and 4-8 actually depict the maximum plausible extent of floating product. The actual extent may be substantially less in areas where a large distance exists between data points.

Difficulty was encountered in obtaining accurate product thickness values at MW-11S during the 7 April measurement round and at MW-12S during both measurement rounds. The floating product at MW-12S may have actually coated the product/water interface probe used to make these measurements, resulting in product readings over the entire length of the well. During 1991, the average product thickness at MW-12S was 0.37 ft. MW-11S is located near the primary organic compound source area for the site. Significant thicknesses of product have been observed at this well in the past. Since the EIPRS was not operational prior to the 7 April measurement round, the "All Product" observation at MW-11S for that measurement round is believed to be real. An approximate product thickness value was calculated by subtracting the bottom-of-screen elevation from the elevation of the top of the product in these wells so that they could be incorporated into the product thickness data set. The resulting product thickness values for MW-11S are minimum estimates which were used in the generation of the product thickness isopach maps presented in Figures 4-6 and 4-7.

The dark oily floating product at MW-12S is thought to be related to discharge from the former underground storage tank number E-2, which was located just north of MW-12S. The consistency of the floating product at MW-12S is substantially different than the product layer centered on MW-11S. The direction of shallow groundwater at MW-12S is northward. The



1115-8428 7/27/92

FIGURE 4-8 ISOPACH MAP OF MEAN FLOATING PRODUCT THICKNESS FOR 1991 L.E. CARPENTER PROPERTY, L.E. CARPENTER SITE, WHARTON, NJ

floating product layer extends from MW-12S northward and merges with clear floating product layer centered on MW-11S.

4.3.2 Extent of Dissolved Organic Compounds

A summary of groundwater data acquired during the course of the RI is provided in Appendix D. The data contained in these tables were utilized to evaluate the extent of dissolved VOC and BN compounds in the shallow aquifer zone at the site. The lateral extent of VOC and BN is depicted graphically in Figures 4-9 and 4-10. These figures indicate that the zones of elevated organic compound concentration are defined by the existing wells at the site. The concentrations of organic compounds at wells which are outside the shaded area in these figures are below the method detection limits. These distribution patterns correlate well with the groundwater flow patterns presented in Figures 3-11 through 3-14 (see Section 3.5.2) The analytical data indicate that low concentrations of dissolved VOC are present as far east as MW-22. The presence of dissolved VOC at MW-22 indicates that lateral dispersion of VOC has occurred. Since VOC have not been detected in MW-14S, the limit of dissolved VOC must lie between MW-22 and MW-14S as depicted in Figure 4-9. This is consistent with the flow pattern presented in Figure 3-13, which indicates that the direction of groundwater flow at MW-22 is toward the Air Products drainage ditch. The extent of dissolved BN in the groundwater at the site is presented in Figure 4-10. The overall pattern is similar to that for the VOC.

4.3.2.1 Abandoned Sewer Line

Figure 4-11 depicts an expanded version of the northeast portion of cross-section B-B' showing both the soil gas borehole locations and the projection of storm sewer pipeline onto the plane of the cross-section. The logs for monitor well MW-21, MW-22 and MW-25 indicate that the permeability of the Qal clay in very low. This unit constitutes an "aquitard" in that it retards the flow of groundwater. At these three wells the water entry zones were below the Qal clay aquitard, within the Qplwg sand. Subsequent to the completion of these wells, water from the Qplwg sand rose within the well-bore to the levels depicted in Figure 4-11. The water rose to these levels under the influence of a vertical hydraulic gradient caused by the permeability contrast between the Qplwg sand the Qal clay. Thus, the water levels in these wells represent the potentiometric surface, not the water table surface, and the pipeline is not in physical contact with the groundwater.

The soil gas data presented in Table 2-3, as well as soils analytical data for the sample collected from test pit TP-89 (see Plate 4 for the location, Appendix A for the geologic log and Table 4-4 for the analytical results) indicate that site related organic compounds are within the Qal silt. Groundwater data for samples collected from MW-21 and MW-25 indicate that groundwater from Qplwg sand does not contain detectable concentrations of organics.

It is believed that the relatively high organic compound concentrations detected in samples from

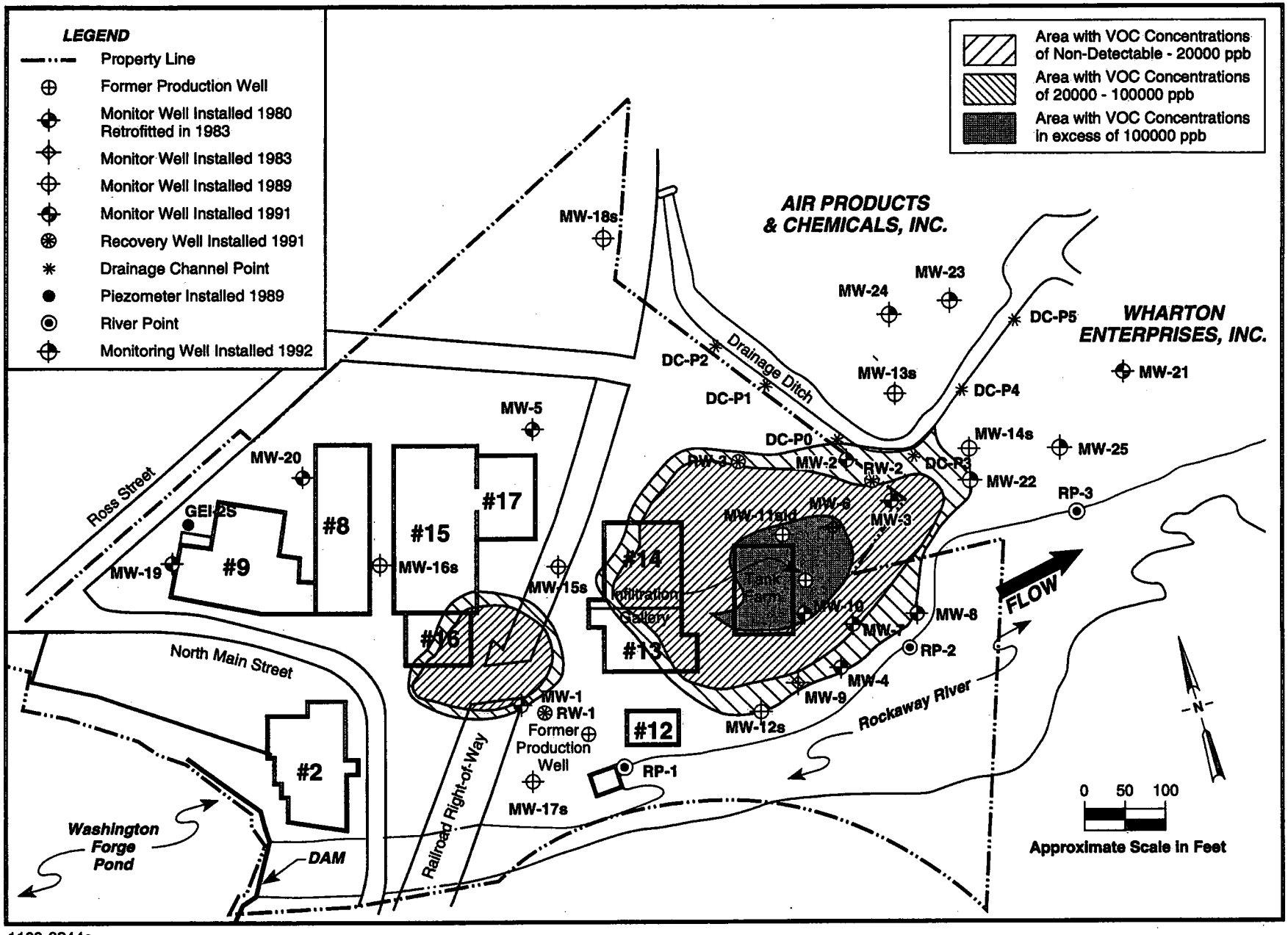


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FIGURE 4-9 MAP SHOWING THE EXTENT OF VOCs IN THE SHALLOW AQUIFER ZONE

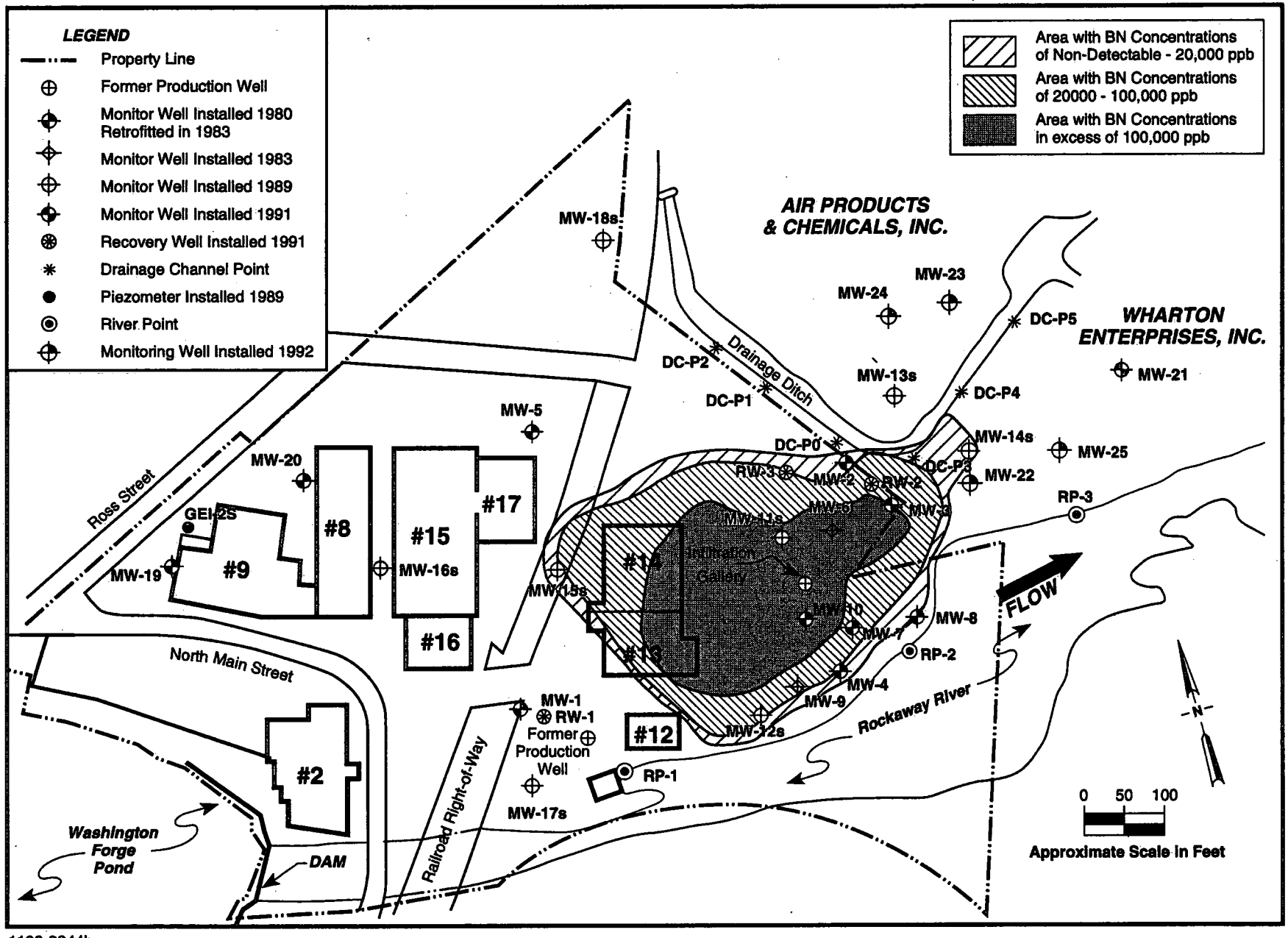

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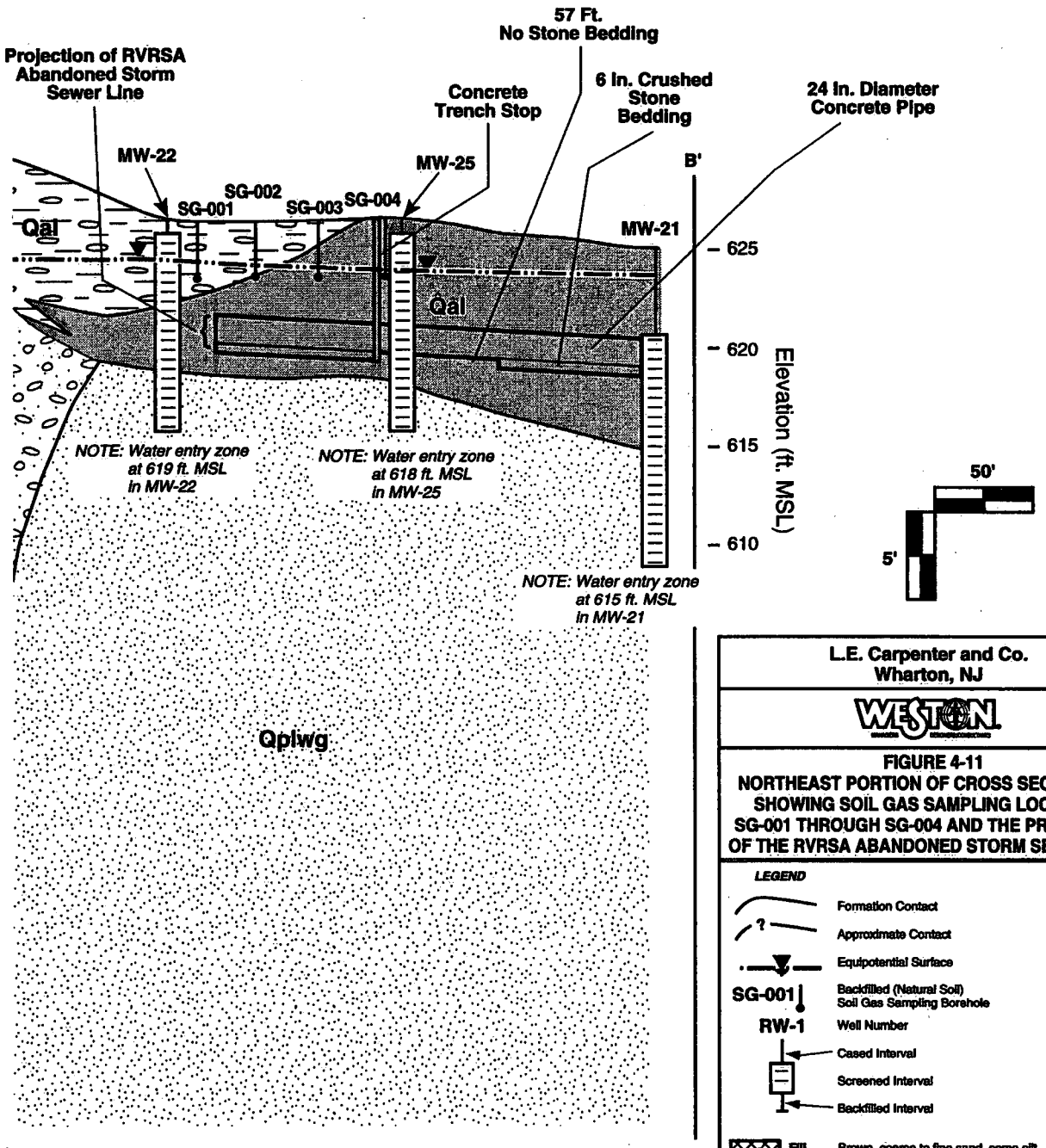
FIGURE 4-10 MAP SHOWING THE EXTENT OF BN IN THE SHALLOW AQUIFER ZONE



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Wharton, NJ

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FIGURE 4-11
NORTHEAST PORTION OF CROSS SECTION B-B' SHOWING SOIL GAS SAMPLING LOCATIONS SG-001 THROUGH SG-004 AND THE PROJECTION OF THE RVRSA ABANDONED STORM SEWER LINE*

LEGEND

- Formation Contact
- ? Approximate Contact
- Equipotential Surface
- SG-001 Backfilled (Natural Soil) Soil Gas Sampling Borehole
- RW-1 Well Number
- Cased Interval
- Screened Interval
- Backfilled Interval

Fill	Fill	Brown, coarse to fine sand, some silt, little gravel, some organic material.
Qal	Clay	Alluvium - grey clay, some silt, trace fine sand, some rounded pebbles
Qal	Silt	Alluvium - dark grey silt, some clay, trace fine to coarse sand, some fine to medium gravel, frequent boulders
Qal	Sand	Alluvium - grey/brown, medium grained sand, little silt trace clay
Qr	Gravel	Rockaway River Outwash - grey, coarse to fine gravel, little coarse to fine sand, abundant cobbles and boulders
Qplwg	Sand	Stratified Deposits - grey/brown coarse to fine sand, little gravel, trace silt, occasional cobbles and boulders

*See Plate 2 for as Built Details

*Stratigraphic nomenclature taken from Sanford (1969).

1141-8623

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TABLE 4-4

SUMMARY OF TEST PIT TP-89 ORGANIC ANALYTICAL TESTING RESULTS

Sample ID: TP-89 Sample Depth (feet): 0.7-1.2	Date Sampled: 8/28/89
Parameter (μg/kg)	
Methylene Chloride	72 JB
Acetone	310 JB
2-Butanone	17 J
Toluene	4 J
Ethylbenzene	26
Xylenes (total)	130
TOTAL TARGETED VOC***	559
bis(2-Ethylhexyl)phthalate	8,000 JB
TOTAL TARGETED BASE NEUTRALS***	8,000
Arochlor-1254 (μg/kg)	2,200 J

NOTES: J - Detected below reporting limit or is an estimated concentration.
B - Compound also detected in laboratory method blank. Sample concentration is more than 5 times the concentration found in the laboratory method blank.
*** - Includes J and B values

MW-22 (see Appendix D) are the result of organics leaching from the Qal silt soil particles into water which has risen through the MW-22 well boring.

Figure 4-11 depicts the configuration of the pipeline projected into the plane of cross section B-B'. This configuration is based on the "as built" diagram presented on Plate 2. This figure shows that the pipeline is installed within, and is fully encompassed by, the Qal clay aquitard. It also shows the fully encompassing concrete trends stop which was installed approximately eighty (80) feet from the pipeline terminus and a fifty-seven (57) foot "no stone bedding" interval east of the trench stop. These two features were specifically designed to prohibit the flow of water along the pipeline. In conjunction with the encompassing Qal clay aquitard, they significantly retard, if not completely prohibit, the flow of organics along the pipeline.

The data presented in this report indicate that no significant flow of organic compounds has not occurred along the bedding of the abandoned RVRSA storm sewer line. This conclusion is fully supported by the following technical arguments:

- Field observations indicate that the bulk of the organic compounds on the Wharton Enterprises Property are within the Qal silt. The sewer line does not come in contact with this formation. It was installed within the Qal clay.

- Field observations made during the installation of MW-21, MW-22 and MW-25 indicate the permeability of the Qal clay is very low. This unit acts as an effective aquitard which significantly retards the flow of groundwater around the pipe.

- Soil gas data indicate that the Qal clay surrounding the pipeline does not contain PID detectable concentrations of organic compounds.

- The "as-built" diagram presented in Plate 2 indicates that a fully encompassing concrete trench stop was installed approximately eighty (80) feet from the pipeline terminus. The concrete trench stop is specifically designed to prohibit the flow of groundwater along the pipeline bedding. No stone bedding was installed over a fifty-seven (57) foot interval east of this trench stop. The Qal clay aquitard is in direct contact with the pipeline over this interval.

- No organic compounds were detected in samples collected from MW-21 and MW-25. These monitoring wells are located approximately twenty (20) feet on either side of the pipeline.

4.3.2.2 Air Products Drainage Ditch

The hydrogeologic setting in the vicinity of the Air Products drainage ditch is presented in Figure 3-10 (see Section 3.3). This figure shows that shallow(a) groundwater flow on both sides

of the ditch is towards the ditch. Therefore, flow of contaminants beyond the ditch in the shallow aquifer zone is not possible. In order to confirm this, additional well(s) will be installed on the Air Products property during the Remedial Design Phase. The well screen(s) will be installed such that the top of the screen is just below the Qal silt/clay unit.

As with the product thickness isopach maps, Figures 4-9 and 4-10 were derived by contouring the organic compound concentration data using the krigging technique. Aerial extent of VOC and BN may be slightly exaggerated in areas where the data points are sparse. These maps represent the maximum plausible extent of the organic compound distribution at the site.

4.4 Summary of Disposal Area Investigations

The objective of this investigation was to confirm the presence of subsurface drums and locate suspected fill areas identified during installation of the EIPRS. Eleven drum carcasses were located and staged for waste classification and subsequent disposal off-site. All 11 of these drums were found in the area bounded by Trenches 1 through 3. All of the drums appeared to be empty and in a crushed state, indicating that the immediate area was used as a location to dispose of damaged drums, lids, etc. None of the drums contained liquid wastes.

The presence of a consistent fill material was also confirmed during completion of test pit excavations. Based upon this information, it appears that the shaded area presented in Figure 4-12 may have been used as a subsurface disposal location. Fill material appeared to be a combination of a white chalky substance and dried sludge, generally deposited in a solid layer approximately 0.5 foot thick at a depth ranging from 3 to 5 feet BGS. Analytical results for the two (2) waste characterization samples collected of the sludge are presented in Table 4-5. Only those compounds which were detected are presented.

The results indicate the sludge material is a potential source area for several VOC and metals. Debris consisting of wood, scrap metal, plastic and drum carcasses, are also thought to be distributed throughout the fill area.

4.5 Surface Water

A summary of significant surface water data is provided in Table 4-6. Full summary tables are presented in Tables 21, 23 and 25 of the revised RI Report, and Table 3-19 of the SRI Report.

It should be noted that the required holding time for those samples collected during the RI (SW1-SW6) was exceeded and conclusions drawn from use of this data is qualified.

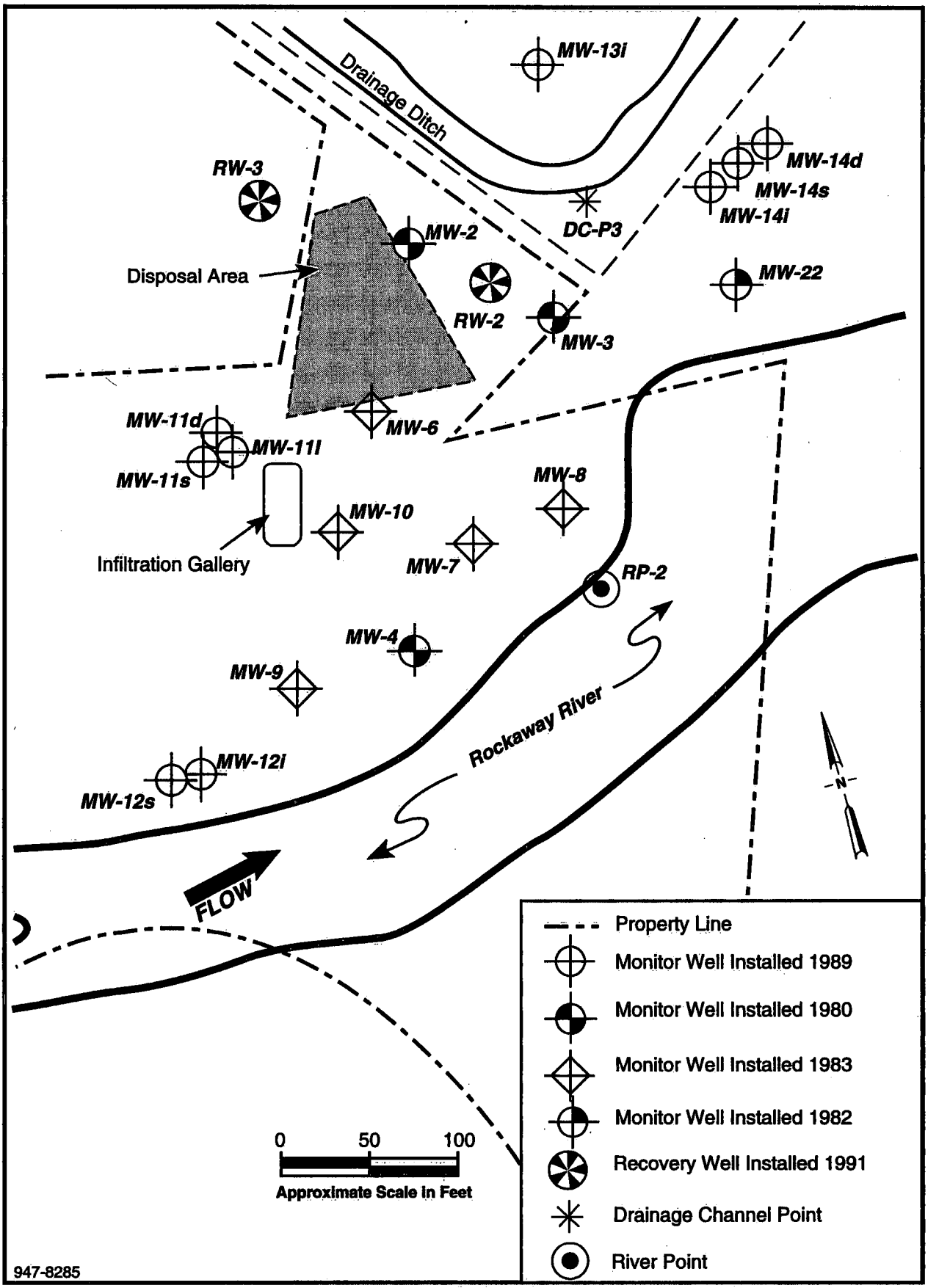

FIGURE 4-12 ESTIMATED EXTENT OF DISPOSAL AREA, L.E. CARPENTER SITE, WHARTON, NJ

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TABLE 4-5

SLUDGE SAMPLING RESULTS

PARAMETER (mg/kg)	SAMPLE 129-001	SAMPLE 129-002
Methylene Chloride	870	900
Toluene	310	ND
Ethylbenzene	14,000	9,300
M-Xylene	31,000	21,000
O&P Xylenes	16,000	11,000
Di-n-butylphthalate	0.93	1.2
Butylbenzylphthalate	0.66	0.58
DEHP	360	430
Aldrin	0.0033	0.0034
Antimony	2,200	3,500
Arsenic	1.71	2.76
Cadmium	145	180
Chromium	960	1,000
Copper	11.2	6.01
Lead	6,100	6,100
Mercury	1.12	0.408
Selenium	10.1	3.16
Zinc	2,200	3,000

TABLE 4-6

SUMMARY OF SURFACE WATER RESULTS
(ug/l)

	Rockaway River			Infiltration Gallery	Drainage Ditch				Rockaway River	
	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
COMPOUND										
Methylene Chloride	1.0 JB	ND	ND	ND	3.8 JB	3.8 JB	ND	ND	ND	ND
1,1,1 Trichloroethane	ND	ND	ND	ND	3.5J	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	1.2J	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	3.5J	ND	ND	ND	ND	ND
Xylenes	ND	ND	ND	ND	44	ND	ND	ND	ND	ND
Unknown VOC	ND	ND	ND	ND	ND	13	ND	ND	ND	ND
Di-n-butyl phthalate	3.2JB	3.7JB	3.6JB	3.5JB	ND	4.0JB	7JB	ND	6JB	ND
Bis(2-ethylhexyl) phthalate	ND	ND	ND	7.25	ND	ND	ND	ND	ND	ND
Antimony	ND	ND	ND	22.8J	ND	ND	NA	NA	NA	ND
Arsenic	ND	ND	2.4J	ND	10	15.9	NA	NA	NA	3.9J
Cadmium	ND	ND	ND	ND	ND	22.2J	NA	NA	NA	ND
Chromium	ND	ND	8.0J	ND	ND	231	NA	NA	NA	ND
Copper	16.7J	5.3J	22.1J	6.7J	ND	405	NA	NA	NA	ND
Lead	20.7	ND	87.2	2.7J	6.0	1,340	NA	NA	NA	4.6J
Mercury	ND	ND	ND	ND	ND	60.8J	NA	NA	NA	ND
Selenium	ND	ND	ND	ND	ND	7.1	NA	NA	NA	ND
Zinc	96.4	4.2J	152	23	60	2,370	NA	NA	NA	5.4J

J = Estimated
B = Compound also detected in method blank
NA = Not analyzed

Surface water samples were collected from the Rockaway River, the drainage ditch, and the infiltration galley located on-site during the RI and SRI. In general, the samples collected from the Rockaway River indicated estimated concentrations (J-values) of methylene chloride, a common laboratory artifact, DEHP, arsenic, chromium, and copper. All of the estimated concentrations were less than 10 ppb. In addition, methylene chloride and DEHP were also detected in the blank samples. Lead and zinc were detected in the Rockaway River at concentrations ranging from 20 to 152 ppb in SW-1 collected upstream of the source area, and SW-3, approximately 15 feet east northeast of MW-8. Samples collected from the drainage ditch indicated xylene at location SW-5 at 44 ppb. All other sample results for VOC and BN compounds are estimated values below 10 ppb. Metals were detected at SW-6 collected from the northern drainage feature which discharges to the ditch. Arsenic and copper were found below 10 ppb in SW-5. At sample location SS-9, the furthest location downstream in the

Rockaway River, all parameters tested for were non-detectable except DEHP, which indicated an estimated concentration of 6 ppb. DEHP was also detected in the QA/QC sample suggesting that laboratory contamination contributes to the total DEHP concentration.

The results indicate that surface water in the vicinity of the L.E. Carpenter site is currently not impacted or degraded. Only one analyte (xylene), was detected in concentrations exceeding estimated or blank values in a sample collected from the drainage ditch.

4.6 Revised Site Model

Conceptual site models qualitatively describe a site and its features and present hypotheses regarding potential or suspected sources, the contaminants present, affected media, and routes of migration. The site model is critical in evaluating exposure scenarios and potential impact on receptors in the risk assessment. The site model attempts to put the potential environmental concerns in clearer focus so that the objectives of the data collection and remediation efforts during the RI/FS are well defined and directed towards those operable units which potentially pose actual risks.

A site model for the L.E. Carpenter site was presented in the Draft FS of May 1991. Based on the data collected since then, the site model has been revised and is graphically presented in Figure 4-13 as well as discussed in the following subsections.

4.6.1 Known or Potential Sources of Contamination

Historically, the potential source areas of contamination from the L.E.Carpenter operations have included process discharges, an unlined surface impoundment, raw material storage, and the spoil piles from the former mining operation. Given the current inactive status of the facility and the remediation efforts completed to date, the source areas on-site remaining include the following:

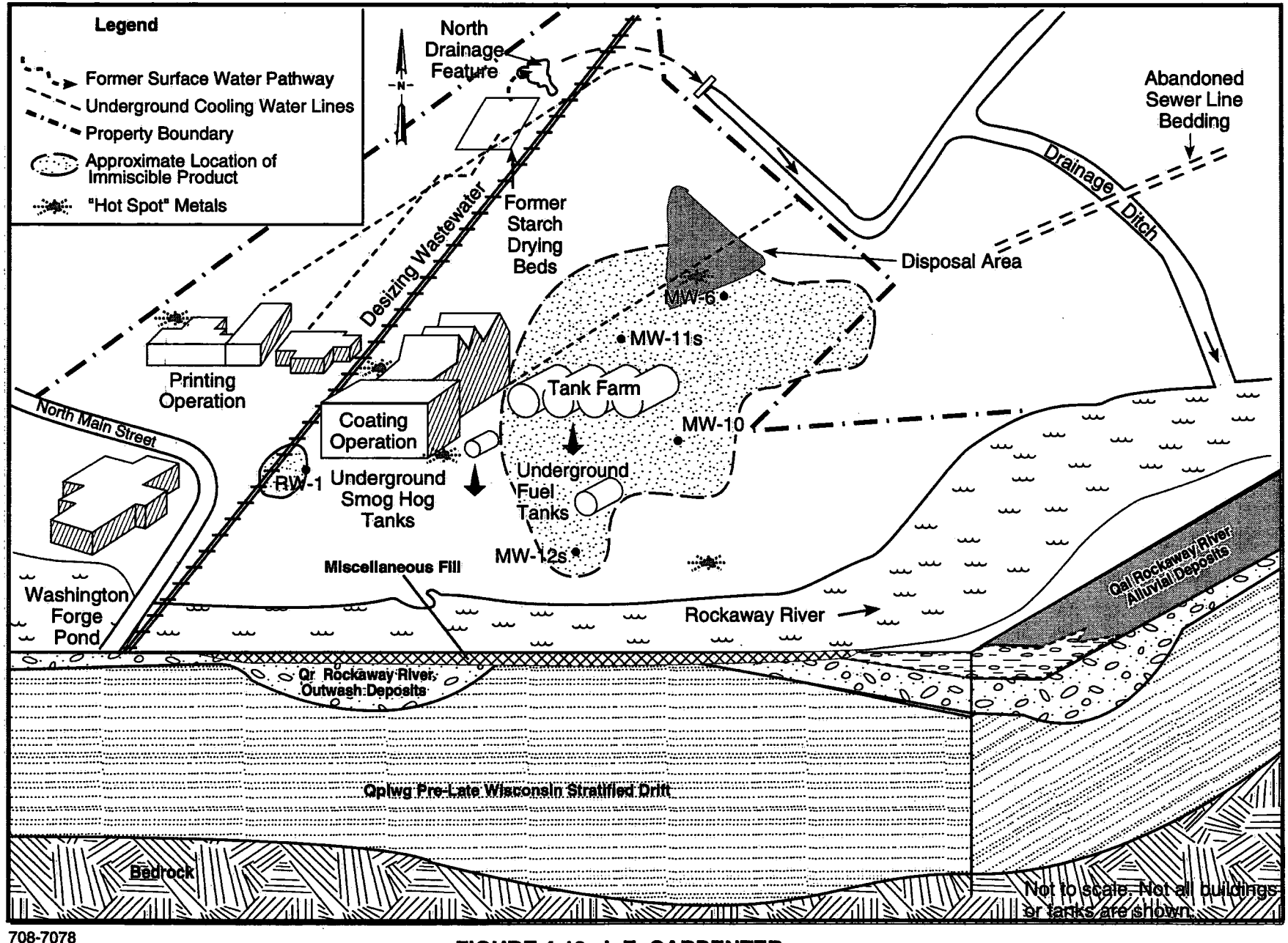

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FIGURE 4-13 L.E. CARPENTER CONCEPTUAL SITE MODEL

- The immiscible product layer,
- Former disposal area(s),
- The former Tank Farm area and historical leakage from USTs, and
- Historical storage of mining spoils, and fill areas.

4.6.2 Contaminant Migration

The movement of contaminants from potential source areas is depicted in Figure 4-13. In general, contaminants have moved into the soil and eventually leached, depending upon their individual solubility, to groundwater. Those contaminants that are insoluble with water (i.e., xylene, ethylbenzene, DEHP) have formed an immiscible floating product layer on top of the shallow groundwater. The immiscible product layer, in turn, continues to provide a potential for contact between soil particles and contaminants.

A dissolved organic contaminant plume is present in shallow groundwater on-site and in the immediate vicinity of the L.E. Carpenter site. The plume is comprised of concentrations of xylene, ethylbenzene, toluene, and DEHP. The plume appears to be contained by the Air Products drainage ditch and a variable clay lense distributed on the Wharton Enterprises property. The plume extends approximately 200 feet onto the Wharton Enterprises property.

Historical migration of the floating product and contaminated groundwater has contacted and, in turn, contaminated soils in the shallow depths. Various historical discharge from process areas have resulted in slightly elevated concentrations of DEHP in soils throughout the eastern portion of the site. Selected areas, mainly associated with loading docks and raw material storage, have indicated elevated levels of lead.

Isolated locations in the Air Products drainage ditch contain elevated levels of metals and BN compounds. Migration and transport of contaminants is not apparent in sediments located downstream of the former source areas. Surface water in the Rockaway River has not been impacted by L.E. Carpenter operations.

Contaminant migration has been mitigated and slowed by the implementation of a passive product recovery system which has been operational since 1982. The system, which was upgraded in 1991, currently recovers approximately 400 gallons a month. In addition, the removal of all underground storage tanks on the property and decontamination of former process facilities has mitigated and prevented any possibility of continuous source areas.

SECTION 5.0

CONCLUSIONS

The various investigation activities completed at the L.E. Carpenter site have resulted in a conclusive understanding of the extent of contamination resulting from the former facility operations. The discussion presented in this section will follow the sequence of issues identified in Section 1.0 of this report.

- Extent of Free Product Migration: The extent of free product migration is presented in Figures 4-6 through 4-8. Based on groundwater sampling results and findings from the most recent geohydrologic investigations, the floating product layer does not extend to the abandoned sewer line. It has, thus far, not impacted the Rockaway River and appears to be restricted to the central portion of the site.

- Extent of Groundwater Contamination: Groundwater flow patterns and the extent of groundwater contamination are discussed in Section 4.3. Groundwater flow patterns are presented in Figure 3-11 to 3-13. Consistent with historical measurements, shallow groundwater is flowing in a northeasterly direction and is discharging to the drainage ditch. The Rockaway River, adjacent to the site, has consistently acted as a recharge zone. Intermediate groundwater, as well, is flowing in a northeasterly direction.

  The areal extent of groundwater contamination is presented in Figures 4-9 and 4-10. Contamination originating from L.E. Carpenter in the shallow groundwater zone is bounded by the Air Products drainage ditch to the north and MW-25 to the east. No contamination has been detected in the intermediate or deep aquifer zones, with the exception of MW-11I. There still remains the possibility of off-site contamination in the shallow zone on the Air Products property. NJDEPE has requested that additional intermediate wells (i.e., below the clay layer) be installed downgradient (on the Air Products property) during the remedial design stage of the project.

- The Use and Interpretation of Background Levels of Sediment Contaminants: WESTON evaluated all of the sediment sampling results in light of the background data collected by USGS. The background data collected during the RI and SRI are consistent with those concentrations of compounds found in sediments in the USGS data. Sediment contaminants are localized in those areas adjacent to the site and immediately downgradient of former discharge pipes. Locations downstream of the facility have not been impacted by L.E. Carpenter as evidenced by concentrations of constituents similar to background levels. Likewise, surface water conditions in the Rockaway River have not been degraded as indicated by the surface water sample results discussed in Section 4.5.

- Domestic Groundwater Use Within One Mile of the Site: All potential groundwater supply wells were identified within one mile of the facility. The downgradient area consists of the shallow (glacial) alluvial aquifers within the Rockaway River Valley to the east and southeast of the site. Two wells were located downgradient of the site. One of those wells is no longer in service and the other is a public supply well operated by the Borough of Wharton. Given our understanding of the lateral extent of contamination, no evidence exists to suggest that downgradient receptor wells could be impacted by shallow groundwater contamination originating from L.E. Carpenter.

- Site Geology: Incorporation of the most recent geohydrologic investigation necessitated modification to the soil profiles presented in the original RI document. In addition, Section 4.3 has been developed in order to correlate the regional geologic features with site specific findings.

- 500-Year Floodplain: The 500-year floodplain delineation is discussed in Section 3.1. Those areas of the site west of the railroad ROW are impacted by the 500-year floodplain delineation. The areas of the site which will undergo remediation are outside both the 100- and 500-year floodplains.

- Cultural Resource Survey: L.E. Carpenter contracted for completion of a Stage 1A Cultural Resource Survey. The findings of the Stage 1A CRS are discussed in Section 3.2. The findings suggest that the L.E. Carpenter site poses a moderate potential to contain artifacts of archeological importance in areas not previously disturbed. The primary area requiring remediation has previously been disturbed from mining activities to a depth of 5 feet; therefore, there is no potential for artifacts to be found in the area where the remediation will take affect.

- Wetlands Survey: The extent of wetland areas include the Wharton Enterprises property along the Rockaway River and portions of the Air Products property along the drainage ditch. The wetland survey found areas on-site and adjacent to the site of ordinary resource value. The wetlands were ranked as having a low to moderate social significance given the historical industrial nature of the surrounding area. Wetlands will not restrict the remedial activities.

  The U.S. Fish and Wildlife Service indicated that *Helonias bullata* (swamp pink), a federally threatened plant species, was previously found in the general area surrounding L.E. Carpenter. During the wetland assessment, no swamp pink or other endangered or threatened plant or animal species were observed. Therefore, endangered species will not affect the remedial activities.

- Disposal Area Investigation: WESTON conducted a supplemental investigation in February 1992 to evaluate an area suspected of containing buried 55-gallon drums. During the execution of the investigation, an area approximately 8,500 sq. feet was formerly used for

debris and waste disposal. Section 3.6 presents a more detailed discussion of the former disposal area and Figure 4-12 presents the approximate extent of fill area. This area will be evaluated as a separate operable unit for inclusion in the Feasibility Study.

The site geology is such that all contaminants are restricted to the shallow aquifer zone on the L.E. Carpenter property and a small portion of the Wharton Enterprises property by a silt/clay aquitard. This unit effectively prohibits downgradient contaminant migration.

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APPENDIX A

MONITORING WELL LOGS

MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 6/17/91 Well No: RW-1

Site: WHARTON, NJ Elevation: Pad 635.19 Top of Steel Casing: 637.38

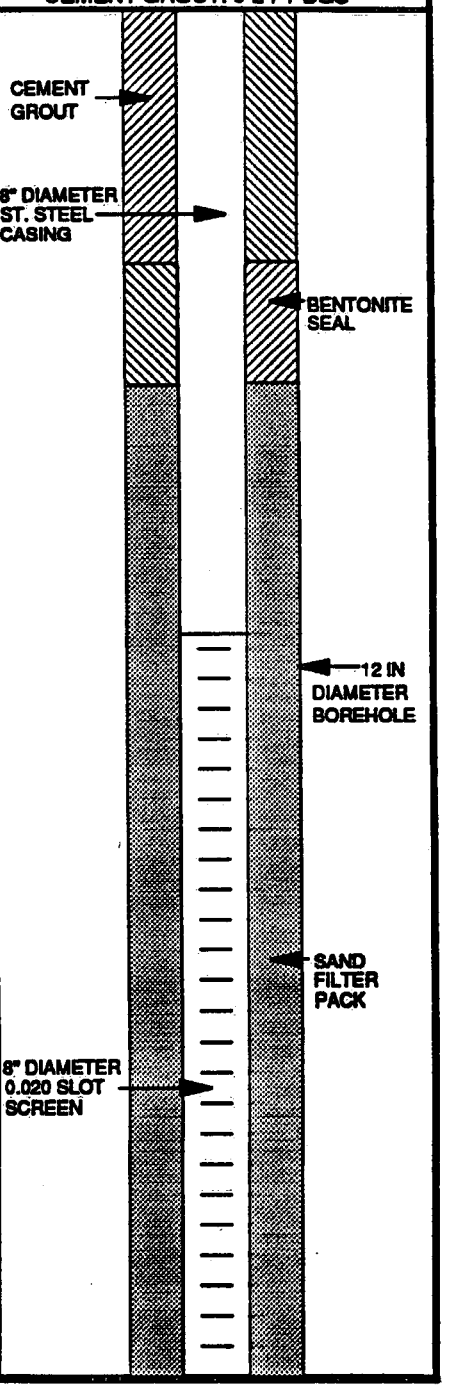
Total Depth: 30 FT BGS Casing Size & Type: 8" ST. STEEL Screen Size: 0.020

Comments: Well installed using mud rotary and drive casing.
Level C protection.

Depth	Blow Count	Sample Description
	6	ASPHALT
	2	
1	3	50% RECOVERY YELLOW BROWN SANDY CLAY, DRY. HNU = 0
	4	
2	5	
	6	75% RECOVERY YELLOW BROWN, MEDIUM GRAINED
3	7	GRAVEL, DRY. HNU IN BREATHING ZONE = 0 PPM
	10	
4	40	
	66	
5	89	75% RECOVERY. BROWN COARSE GRAINED SANDY GRAVEL, DRY
	100	
6	66	
	89	
7	25	A/A
	25	
8	47	
	32	
9	30	50% RECOVERY. GRAY-BROWN COARSE GRAINED GRAVEL, WET TO SATURATED. 40 UNITS ON HNU.
	14	
10		WATER AT 10 FT.

Completion Data

SCREEN: 5-30 FT BGS
SAND FILTER PACK: 3-30 FT BGS
BENTONITE SEAL: 2-3 FT BGS
CEMENT GROUT: 0-2 FT BGS



MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 6/17/91 Well No: RW-1

Site: WHARTON, NJ Elevation: Pad 635.19 Top of Steel Casing: 637.38

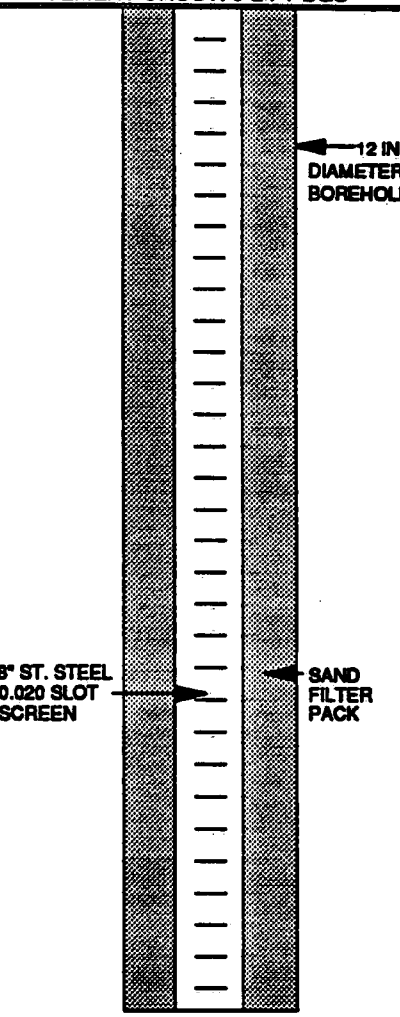
Total Depth: 30 FT BGS Casing Size & Type: 8" ST. STEEL Screen Size: 0.020

Comments: WELL INSTALLED USING MUD ROTARY AND DRIVE CASING.
LEVEL C PROTECTION.

Depth	Blow Count	Sample Description
11	9	50% RECOVERY. GRAY BROWN COARSE-GRAINED GRAVEL, SATURATED. HNU = 600 UNITS. ODIFERROUS
	24	
	17	
12	18	
	18	50% RECOVERY. GARY BROWN. COARSE GRAINED GRAVEL, SATURATED. HNU = 50 UNITS.
13	38	
	29	
14	20	
15		SPLIT SPOONS TAKEN AT 5 FT. INTERVALS FROM 15 - 30 FT. BGS HNU = 0 UNITS
20		70% RECOVERY GRAY BROWN, COARSE GRAINED GRAVEL, SATURATED. HNU = 0 UNITS.
25		65% RECOVERY GRAY BROWN, COARSE GRAINED GRAVEL, SATURATED.
30		50% RECOVERY GRAY BROWN, COARSE GRAINED GRAVEL, SATURATED.

Completion Data

SCREEN: 5-30 FT BGS
SAND FILTER PACK: 3-30 FT BGS
BENTONITE SEAL: 2-3 FT BGS
CEMENT GROUT: 0-2 FT BGS



MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(one form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, NJ
NJPDES Permit No. NJ00 or ECRA case No.:

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5- 3 8 9 5 2
Owner's Well Number (As shown on the application or plans):	RW-1
Well Completion Date:	06/17/91
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	2 ft. 0 in.
Total Depth of Well to the nearest 1/2 foot:	37 ft.
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	5 ft.
Screen Length (or length of open hole) in feet:	25 ft.
Screen or Slot Size:	0.020 slot
Screen or Slot Material:	stainless steel
Casing Material: (PVC, Steel or Other-Specify):	stainless steel
Casing Diameter (inches):	8 inches
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	10 ft.
Yield (gallons per minute):	8 gpm
Development Technique (specify)	submersible pump
Length of Time Well is Developed Pumped or Bailed:	1 Hours 0 Minutes
Lithologic Log:	Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Scott Hollabaugh — Name (Type or Print)
Scott Hollabaugh — Signature

1511 — Certification or License No.
Seal

Certification by Executive Officer or Duly Authorized Representative

Alexander A. Kiwalle — Name (Type or Print)
Alexander A. Kiwalle — Signature

Assistant Drilling Manager — Title
6/09/92 — Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATION

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation):
This number must be permanently affixed to the well casing. 25-38952

Longitude (one-tenth of a second): West 74° 34' 39.1"
Latitude (one-tenth of a second): North 40° 54' 13.6"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): INNER WELL 637.38
Owners Well Number (As shown on application or plans): RW-1

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to be a major modification of the NJPDES permit.

MONITOR WELL INSTALLATION

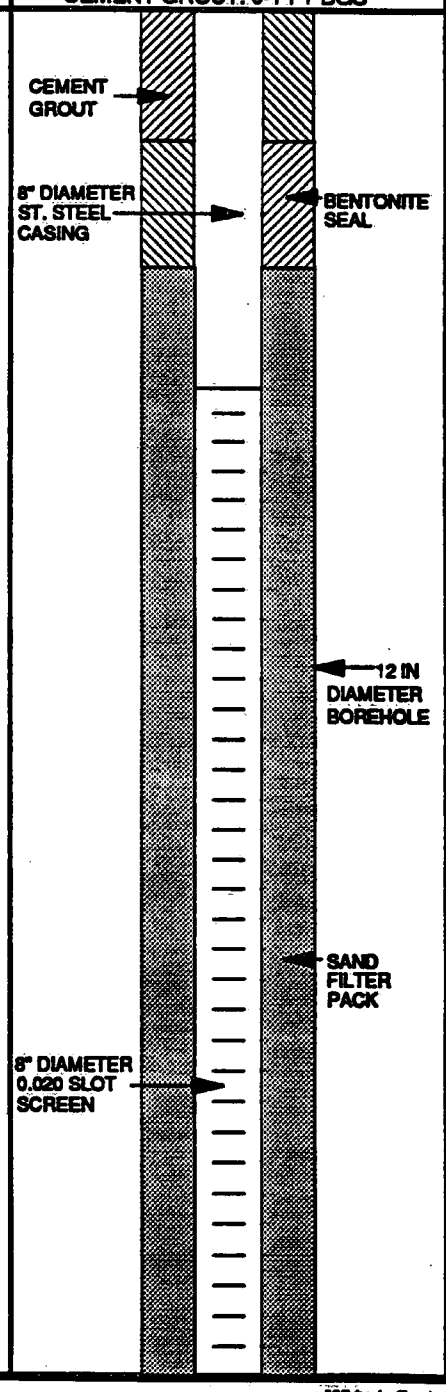
Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 6/22/91 Well No: RW-2

Site: WHARTON, NJ Elevation: Pad 629.80 Top of Steel Casing: 631.68

Total Depth: 30 FT BGS Casing Size & Type: 8" ST. STEEL Screen Size: 0.020

Comments: Well installed using air rotary with 12" diameter temporary drive casing.
Level C protection.

Depth	Blow Count	Sample Description
1	35	ASPHALT
	12	
	7	GRAY, CLAY RICH SILT, DRY 25% RECOVERY
2	6	
	14	
3	12	25% RECOVERY
	14	GRAY, CLAY RICH SILT, WET
4	16	
	14	
5	12	BLACK STAINED SANDY GRAVEL, SATURATED WATER AT 4 FT. HNU ON SPOON = 10 PPM.
	14	
6	16	
	11	
7	7	BLACK STAINED COARSE GRAVEL, SATURATED HNU = 5 - 10 PPM ON SPOON SHEEN IN WATER - OILY
	7	
8	7	
	27	
9	38	BLACK STAINED COARSE SANDY GRAVEL, SATURATED HNU ON SPOON = 5 - 10 PPM
	30	
10	4	GRAY, COARSE GRAINED GRAVEL



MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 6/22/91 Well No: RW-2

Site: WHARTON, NJ Elevation: Pad 629.89 Top of Steel Casing: 631.68

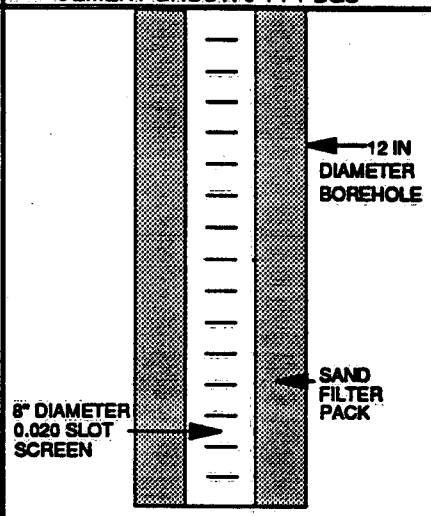
Total Depth: 30 FT BGS Casing Size & Type: 8" ST. STEEL Screen Size: 0.020

Comments: Well installed using air rotary with 12" diameter temporary drive casing.
Level C protection.

Depth	Blow Count	Sample Description
15		SPLIT SPOON COLLECTED AT 5 FT. INTERVALS FROM 15 FT. TO 28 FT. BGS GRAY, COARSE GRAINED GRAVEL, SATURATED. HNU IN BREATHING ZONE = 10 - 15 PPM.
20		A/A
25		A/A
30		

Completion Data

SCREEN: 3-30 FT BGS
SAND FILTER PACK: 2-30 FT BGS
BENTONITE SEAL: 1-2 FT BGS
CEMENT GROUT: 0-1 FT BGS



MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(one form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, NJ
NJPDES Permit No. NJ00 or ECRA case No.:

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5- 3 8 9 5 3
Owner's Well Number (As shown on the application or plans):	RW-2
Well Completion Date:	07/02/91
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	2 ft. 3 in.
Total Depth of Well to the nearest 1/2 foot:	28 ft.
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	3 ft.
Screen Length (or length of open hole) in feet:	25 ft.
Screen or Slot Size:	0.020 slot
Screen or Slot Material:	stainless steel
Casing Material: (PVC, Steel or Other-Specify):	stainless steel
Casing Diameter (inches):	8 inches
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	5 ft.
Yield (gallons per minute):	25 gpm
Development Technique (specify)	submersible pump
Length of Time Well is Developed Pumped or Bailed:	1 Hours 0 Minutes
Lithologic Log:	Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Jeff Jaworski — Name (Type or Print)

Jeff Jaworski — Signature

1315 — Certification or License No.

Seal

Certification by Executive Officer or Duly Authorized Representative

Alexander A. Kiwalle — Name (Type or Print)

Alexander A. Kiwalle — Signature

Assistant Drilling Manager — Title

6/09/92 — Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATION

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:
This number must be permanently affixed to the well casing. 25-389513

Longitude (one-tenth of a second): West 74°34'32.8"
Latitude (one-tenth of a second): North 40°54'14.2"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): INNER WELL 631.68
Owners Well Number (As shown on application or plans): RW-2

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to be a major modification of the NJPDES permit.

MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 6/21/91 Well No: RW-3

Site: WHARTON, NJ Elevation: Pad 629.89 Top of Steel Casing: 631.99

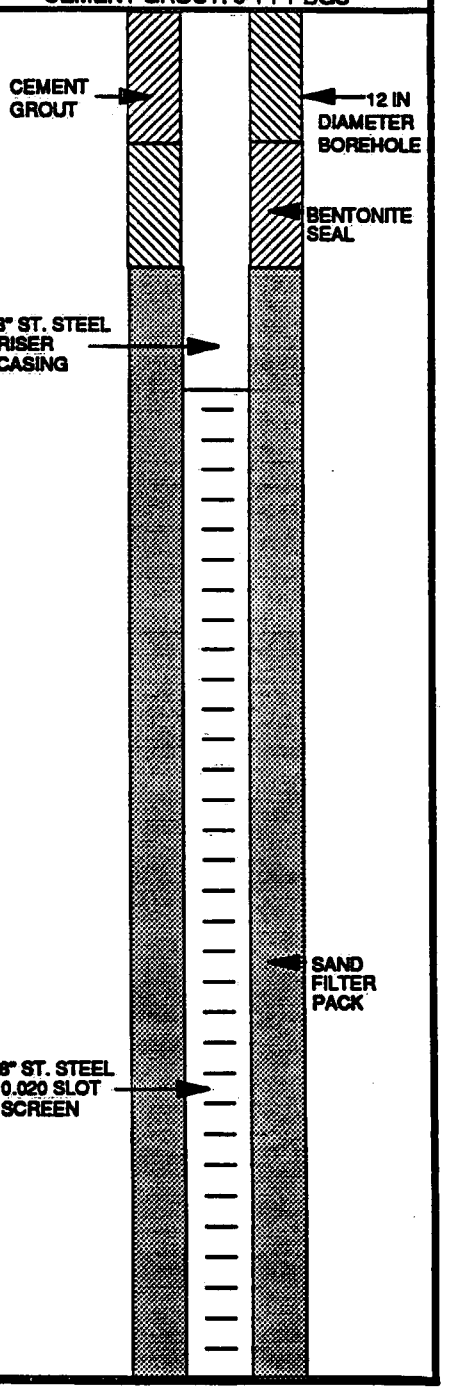
Total Depth: 28 FT BGS Casing Size & Type: 8" ST. STEEL Screen Size: 0.020

Comments: Split spoons driven continuously to 16 ft. in level D protection. HNu breathing zone = 0 ppm. Borehole advanced using air rotary, level C protection, HNu = 50 ppm in breathing zone.

Depth	Blow Count	Sample Description
1	7	10% RECOVERY. SILTY TOPSOIL, DRY.
	64	
	14	
2	4	
	4	
3	8	10% RECOVERY. SILTY CLAY, WET. SOME PEEBLES IN CLAY MATRIX HNU ON SPOON = 50 PPM
	9	
4	4	
	4	
5	8	50% RECOVERY. GRAY STIFF CLAY, WET TO SATURATED. HNU ON SPOON = 500 PPM WATER AT 4.5 FT. HNU IN AIR = 50 PPM.
	10	
6	16	
	18	
7	15	25% RECOVERY. GRAY SILTY CLAY, SATURATED. SOME PEEBLES IN CLAY MATRIX HNU ON SPOON = 100 PPM HNU IN AIR = 200 PPM.
	17	
8	9	
	5	GRAY STIFF CLAY, WET.
9	4	GRAY SANDY GRAVEL, SATURATED.
	6	25% RECOVERY, HNU ON SPOON = 25 PPM HNU IN AIR = 75 PPM.
10	24	

Completion Data

SCREEN: 3-28 FT BGS
SAND FILTER PACK: 2-28 FT BGS
BENTONITE SEAL: 1-2 FT BGS
CEMENT GROUT: 0-1 FT BGS



MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 6/21/91 Well No: RW-3

Site: WHARTON, NJ Elevation: Pad 629.89 Top of Steel Casing: 631.99

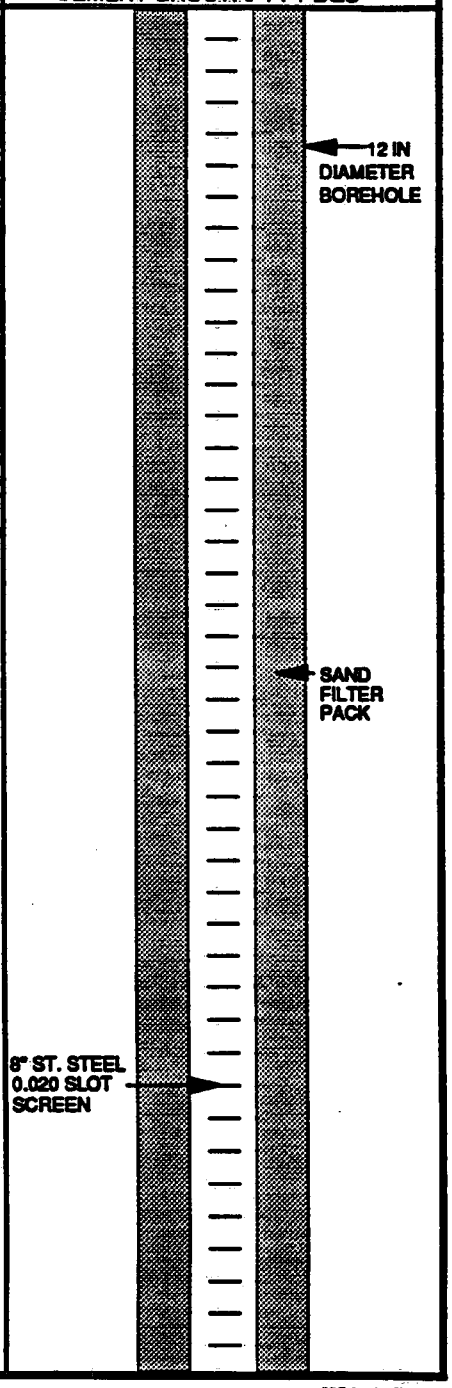
Total Depth: 28 FT BGS Casing Size & Type: 8" ST. STEEL Screen Size: 0.020

Comments: Split spoons driven continuously to 16 ft. in level D protection. HNu breathing zone = 0 ppm. Borehole advanced using air rotary, level C protection.

Depth	Blow Count	Sample Description
11	9	
	24	75% RECOVERY. GRAY SANDY GRAVEL, SATURATED. HNU ON SPOON = 200 PPM
	17	
12	18	
	18	
	38	75% RECOVERY. GRAY COARSE GRAINED SANDY GRAVEL, SATURATED. HNU ON SPOON = 200 PPM
13	29	
	20	
14	34	
	21	75% RECOVERY. GRAY COARSE GRAINED SANDY GRAVEL, SATURATED. HNU ON SPOON = 40 PPM
15	22	
	31	
16		A/A
		NO SPLIT SPOONS COLLECTED BELOW 16 FT. BGS, DUE TO SAMPLE WASHOUT. ALL DESCRIPTIONS ARE FROM DRILL CUTTINGS.
17		
18		
19		
20		

Completion Data

SCREEN: 3-28 FT BGS
SAND FILTER PACK: 2-28 FT BGS
BENTONITE SEAL: 1-2 FT BGS
CEMENT GROUT: 0-1 FT BGS



MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 6/21/91 Well No: RW-3

Site: WHARTON, NJ Elevation: Pad 629.89 Top of Steel Casing: 631.99

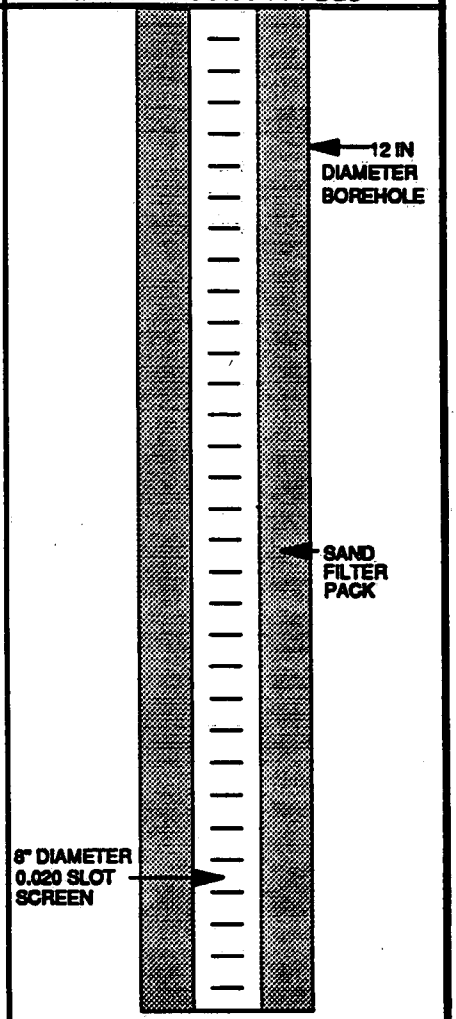
Total Depth: 28 FT BGS Casing Size & Type: 8" ST. STEEL Screen Size: 0.020

Comments: Split spoons driven continuously to 16 ft. in level D protection. HNu breathing zone = 0 ppm. Borehole advanced using air rotary, level C protection.

Depth	Blow Count	Sample Description
21		NO SPLIT SPOON SAMPLES COLLECTED DUE TO WASH OUT. ALL DESCRIPTIONS ARE FROM DRILL CUTTINGS.
		GRAY COARSE GRAINED GRAVEL, SATURATED, MANY ROUNDED PEBBLES AND COBBLES
22		
23		A/A
24		
25		A/A
26		
27		
28		A/A

Completion Data

SCREEN: 3-28 FT BGS
SAND FILTER PACK: 2-28 FT BGS
BENTONITE SEAL: 1-2 FT BGS
CEMENT GROUT: 0-1 FT BGS



MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(one form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, NJ
NJPDES Permit No. NJ00 or ECRA case No.:

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5- 3 8 9 5 4
Owner's Well Number (As shown on the application or plans):	RW-3
Well Completion Date:	06/22/91
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	1 ft. 6 in.
Total Depth of Well to the nearest 1/2 foot:	28 ft.
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	3 ft.
Screen Length (or length of open hole) in feet:	25 ft.
Screen or Slot Size:	0.020 slot
Screen or Slot Material:	stainless steel
Casing Material: (PVC, Steel or Other-Specify):	stainless steel
Casing Diameter (inches):	8 inches
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	5 ft.
Yield (gallons per minute):	20 gpm
Development Technique (specify)	submersible pump
Length of Time Well is Developed Pumped or Bailed:	0 Hours 30 Minutes
Lithologic Log:	Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Jeff Jaworski — Name (Type or Print)

Jeff Jaworski — Signature

1315 — Certification or License No.

Seal

Certification by Executive Officer or Duly Authorized Representative

Alexander A. Kiwalle — Name (Type or Print)

Alex A. Kiwalle — Signature

Assistant Drilling Manager — Title

6/09/92 — Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATIO

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation): 25-389541
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74°34'33.9"
Latitude (one-tenth of a second): North 40°54'14.9"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): INNER WELL 631.99
Owners Well Number (As shown on application or plans): RW-3

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to be a major modification of the NJPDES permit.

MONITOR WELL INSTALLATION

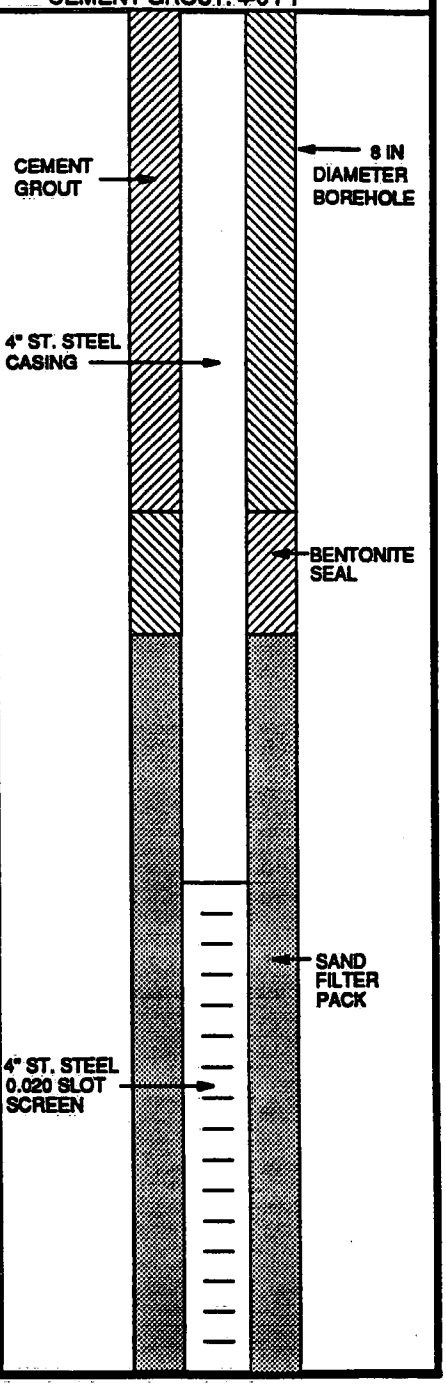
Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 5/20/91 Well No: MW-19

Site: WHARTON, NJ Interval: 7-17 FT Top of Steel Casing: _____

Total Depth: 17.0 FT Casing Size & Type: 4" ST. STEEL Screen Size: 0.020

Comments: _____

Depth	Blow Count	Sample Description
1	2	25% RECOVERY. COARSE SAND FILL. LAST 2" IS BLACK SILTY SAND.
	6	
	10	
2	9	
	13	25% RECOVERY. COARSE SAND FILL OVER SANDY CLAY WITH SMALL PEBBLES
3	14	
	19	
4	27	
	14	25% RECOVERY. YELLOW-BROWN SILTY CLAY.
5	10	
	8	
6	20	COBBLE AND BOULDER ZONE BEGINS
	28	25% RECOVERY. HNU=BG. REDDISH-BROWN CLAY (SAPROLITE) W/ COBBLE FRAGMENTS. SPOON WAS SITTING ON TOP OF COBBLE. REFUSAL ENCOUNTERED.
7	58	
	50/2	
8		
		BOULDERS - DRY HNU=BG NO RECOVERY
9		
10		WATER AT 10 FT



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MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 5/20/91 Well No: MW-19

Site: WHARTON, NJ Interval: 7-17 FT Top of Steel Casing: _____

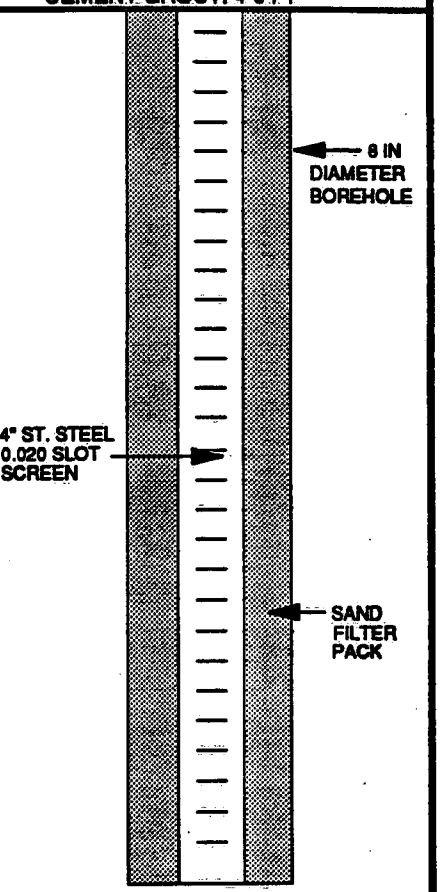
Total Depth: 17.0 FT Casing Size & Type: 4" ST. STEEL Screen Size: 0.020

Comments: _____

Depth	Blow Count	Sample Description
11		HOLE ADVANCED THROUGH COBBLES TO 11 FT
12	23	75% RECOVERY. BROWN COARSE SAND WITH STRONG ODOR OF MEK. HNU=200 UNITS ON SPOON, 100 UNITS IN BREATHING ZONE. CREW UPGRADED TO LEVEL C.
13	18	
	52	
14	73	100% RECOVERY. LIGHT BROWN SANDY GRAVEL WITH STAINING FROM 14-15 FT. HNU=50 UNITS
15		
16		CUTTINGS - AS ABOVE
17		TD = 17.0 FT
18		MATERIALS: 10 FT 0.020 SLOT ST. STEEL 4" SCREEN 10 FT ST. STEEL 4" CASING 1 BUCKET BENTONITE PELLETS
19		
20		

Completion Data

SCREEN: 17-7 FT
SAND FILTER PACK: 17-5 FT
BENTONITE SEAL: 5-4 FT
CEMENT GROUT: 4-0 FT



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JUN 25 92 12:03 PM

MONITORING WELL CERTIFICATION = FORM A = AS-BUILT CERTIFICATION
(One form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, New Jersey
NJPDES Permit No.: NJ00 **or ECRA case No.:** 87561

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5 - 3 8 8 0 3 -
Owner's Well Number (As shown on the application or plans):	MW-19
Well Completion Date:	5-22-91
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	-0-
Total Depth of Well to the nearest 1/2 foot:	17.0'
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	7.0'
Screen Length (or length of open hole) in feet:	10.0'
Screen or Slot Size:	.020
Screen or Slot Material:	Stainless Steel
Casing Material: (PVC, Steel or Other-Specify):	Stainless Steel
Casing Diameter (inches):	4"
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	9'
Yield (gallons per minute):	Less Than 3 GPM
Development Technique (specify)	Bailed
Length of Time Well is Developed/ Pumped or Bailed:	0 Hours 30 Minutes
Lithologic Log:	Attach

Authentication
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Donald J. Grahamer
Name (Type or Print)

Donald J. Grahamer
Signature

Journeyman #1213
Certification or License No.

Seal

Certification by Executive Officer or Duly Authorized Representative

Robert Kreilick
Name (Type or Print)

Robert Kreilick
Signature

Vice President of Operations
Title

June 9, 1992
Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATIO

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation): 25-3 8803
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74°34'43.7"
Latitude (one-tenth of a second): North 40°54'17.1"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): INNER WELL 638.88
Owners Well Number (As shown on application or plans): MW-19

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to be a major modification of the NJPDES permit.

MONITOR WELL INSTALLATION

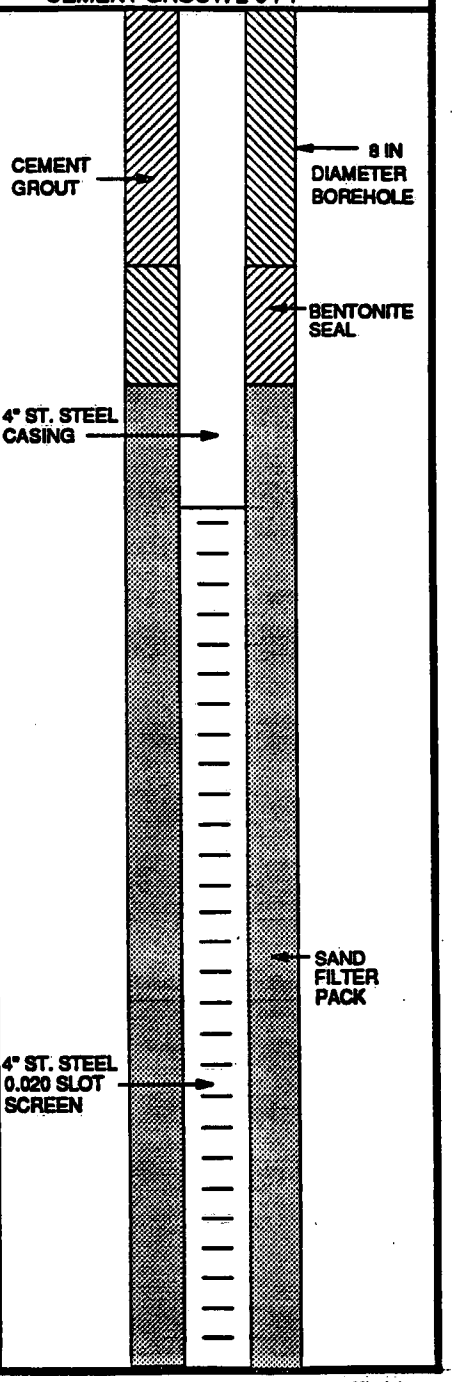
Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 5/21/91 Well No: MW-20

Site: WHARTON, NJ Interval: 4-14 FT Top of Steel Casing: _____

Total Depth: 14.0 FT Casing Size & Type: 4" ST. STEEL Screen Size: 0.020

Comments: _____

Depth	Blow Count	Sample Description
1	2	10% RECOVERY. MED GRAINED SANDY FILL MATERIAL
	5	
	6	
2	3	
	2	0% RECOVERY.
	3	
3	3	
	4	
4	2	10% RECOVERY. BROWN FINE GRAINED CLAY-RICH SAND WITH BLACK STAINING. DAMP. HNU=NR
	1	
5	5	
	16	
6	16	WATER AT 6 FT
	15	25% RECOVERY. GREY, VERY STIFF CLAY WITH SMALL, ROUNDED PEBBLES. HNU=1/2 UNIT ABOVE BG.
7	25	
	10	
8	7	
	40	25% RECOVERY. GREY, VERY STIFF CLAY WITH MOTTLING. HNU=BG.
9	28	
	15	
10	10	
	8	



MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 5/21/91 Well No: MW-20

Site: WHARTON, NJ Interval: 4-14 FT Top of Steel Casing: _____

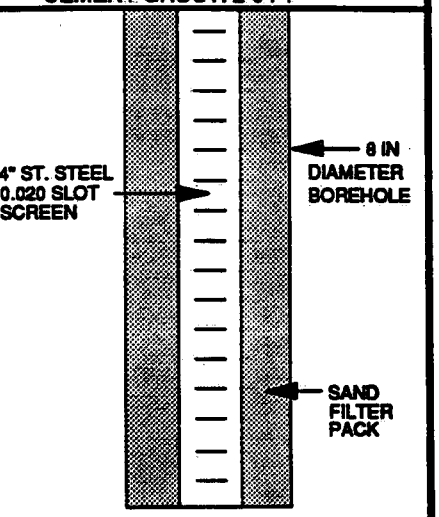
Total Depth: 14.0 FT Casing Size & Type: 4" ST. STEEL Screen Size: 0.020

Comments: _____

Depth	Blow Count	Sample Description
11	10	AS ABOVE
	8	
	17	
12	15	
	10	AS ABOVE, CLAY BECOMING SANDY CLAY WITH SOME SMALL ROUNDED PEBBLES
	20	
13	45	
	45	TD = 14.0 FT
14		MATERIALS: 10 FT 0.020 SLOT ST. STEEL 4" SCREEN 6 FT ST. STEEL 4" CASING 1/2 BUCKET BENTONITE PELLETS
15		
16		
17		
18		
19		
20		

Completion Data

SCREEN: 14-4 FT
SAND FILTER PACK: 14-3 FT
BENTONITE SEAL: 3-2 FT
CEMENT GROUT: 2-0 FT



MONITORING WELL CERTIFICATION = FORM A = AS-BUILT CERTIFICATION
(One form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, New Jersey
NJPDES Permit No.: NJ00 **or ECRA case No.:** 87561

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5 - 3 3 8 0 4 -
Owner's Well Number (As shown on the application or plans):	MW-20
Well Completion Date:	5-22-91
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	-0-
Total Depth of Well to the nearest 1/2 foot:	14.0'
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	4.0'
Screen Length (or length of open hole) in feet:	10.0'
Screen or Slot Size:	.020
Screen or Slot Material:	Stainless Steel
Casing Material: (PVC, Steel or Other-Specify):	Stainless Steel
Casing Diameter (inches):	4"
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	6'
Yield (gallons per minute):	Less Than 3 GPM
Development Technique (specify)	Bailed
Length of Time Well is Developed/ Pumped or Bailed:	0 Hours 30 Minutes
Lithologic Log:	Attach

Authentication
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Donald J. Grahamer — **Name (Type or Print)**

Donald J. Grahamer — **Signature**

Journeyman #1213 — **Certification or License No.**

Seal

Certification by Executive Officer or Duly Authorized Representative

Robert Kreilick — **Name (Type or Print)**

Signature

Vice President of Operations — **Title**

June 9, 1992 — **Date**

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATION

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation): 25-388004
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74° 34' 41.2"
Latitude (one-tenth of a second): North 40° 54' 17.2"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): INNER WELL 636.77
Owners Well Number (As shown on application or plans): MW-20

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to be a major modification of the NJPDES permit.

MONITOR WELL INSTALLATION

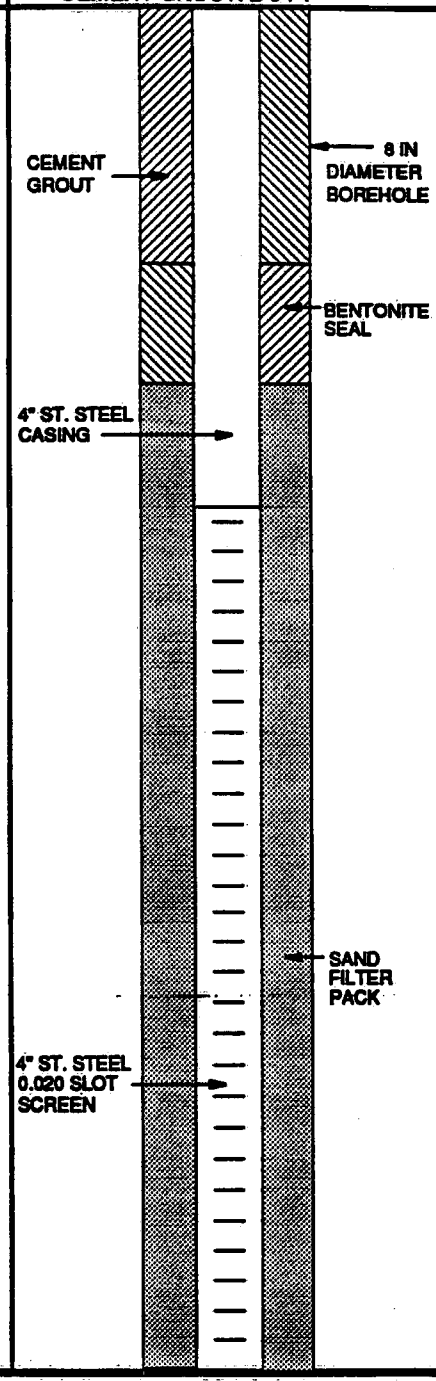
Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 5/22/91 Well No: MW-21

Site: WHARTON, NJ Interval: 5-15 FT Top of Steel Casing: _____

Total Depth: 15.0 FT Casing Size & Type: 4" ST. STEEL Screen Size: 0.020

Comments: _____

Depth	Blow Count	Sample Description
1	28	75% RECOVERY. 0-6" DARK BROWN TOPSOIL/ HUMUS. 6-24 YELLOW-BRN MOTTLED STIFF CLAY.
	20	
	18	
2	32	
	-	0% RECOVERY.
	-	
3	14	
	7	
4	9	
	14	10% RECOVERY. BROWN FINE GRAINED CLAY-RICH SAND WITH BLACK STAINING. DAMP. HNU=NR
5	6	
	7	
6	20	WATER AT 6 FT
	45	25% RECOVERY. GREY, VERY STIFF CLAY WITH SMALL, ROUNDED PEBBLES. HNU=1/2 UNIT ABOVE BG.
7	17	
	50	
8	75	
	66	25% RECOVERY. GREY, VERY STIFF CLAY WITH MOTTLING. HNU=BG.
9	16	
	65	
10	88	
	105	



MONITOR WELL INSTALLATION

Client: L. E. CARPENTER Job No: 3600-05-67 Date Drilled: 5/22/91 Well No: MW-21

Site: WHARTON, NJ Interval: 5-15 FT Top of Steel Casing: _____

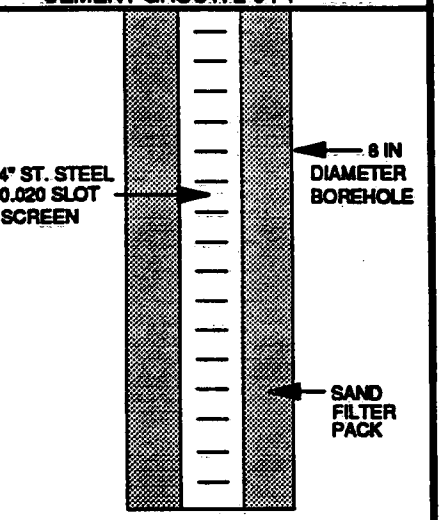
Total Depth: 15.0 FT Casing Size & Type: 4" ST. STEEL Screen Size: 0.020

Comments: _____

Depth	Blow Count	Sample Description
12	21	100% RECOVERY. 0-12" BROWN, WELL-SORTED FINE G. SAND. 12-24" BROWN, WELL SORTED COARSE G. SAND.
	6	
	5	EXHIBITS DOWNWARD COARSENING
13	50	
	43	
14	47	100% RECOVERY. BROWN, WELL-SORTED COARSE G. SAND COARSENING INTO GRAVEL
	52	
15	80	TD = 15.0 FT
16		MATERIALS: 10 FT 0.020 SLOT ST. STEEL 4" SCREEN 10 FT ST. STEEL 4" CASING 1 BUCKET BENTONITE PELLETS
17		
18		
19		
20		
21		

Completion Data

SCREEN: 15-5 FT
SAND FILTER PACK: 15-3 FT
BENTONITE SEAL: 3-2 FT
CEMENT GROUT: 2-0 FT



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MONITORING WELL CERTIFICATION = FORM A = AS-BUILT CERTIFICATION
(One form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, New Jersey
NJPDES Permit No.: NJ00 **or ECRA case No.:** 87561

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5 - 3 8 8 0 5 -
Owner's Well Number (As shown on the application or plans):	MW-21
Well Completion Date:	5-22-91
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	-0-
Total Depth of Well to the nearest 1/2 foot:	15.0'
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	5.0'
Screen Length (or length of open hole) in feet:	10.0'
Screen or Slot Size:	.020
Screen or Slot Material:	Stainless Steel
Casing Material: (PVC, Steel or Other-Specify):	Stainless Steel
Casing Diameter (inches):	4"
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	6'
Yield (gallons per minute):	Less than 3 GPM
Development Technique (specify)	Bailed
Length of Time Well is Developed/ Pumped or Bailed:	0 **Hours** 30 **Minutes**
Lithologic Log:	**Attach**

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Donald J. Grahamer
Name (Type or Print)

Donald J. Grahamer
Signature

Journeyman #1213
Certification or License No.

Seal

Certification by Executive Officer or Duly Authorized Representative

Robert Kreilick
Name (Type or Print)

Signature

Vice President of Operations
Title

June 9, 1992
Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATIO

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation): 25-38805
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74° 34' 28.2"
Latitude (one-tenth of a second): North 40° 54' 14.1"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): INNER WELL 628.80
Owners Well Number (As shown on application or plans): MW-21

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

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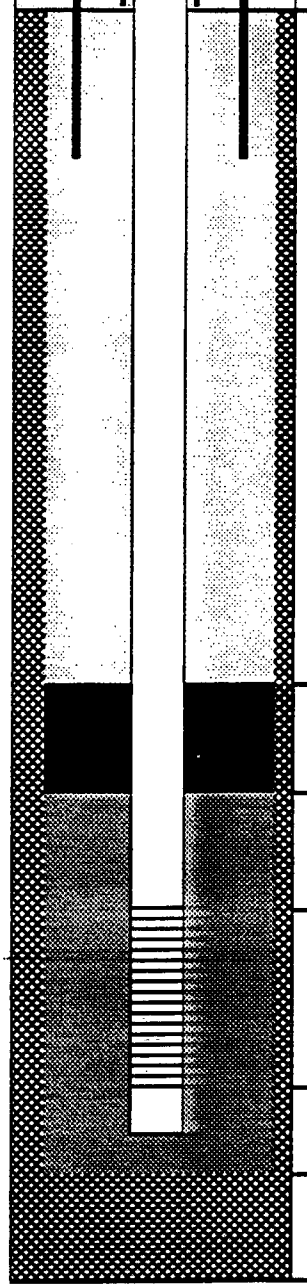
Well Completion Summary

ROY F. WESTON, Inc.

CLIENT	L. E. CARPENTER	*DRILLING FIRM*	EMPIRE SOILS INVESTIGATIONS
SITE NAME	WHARTON ENTERPRISES	*INSPECTOR*	KEN TYSON

WELL ID	MW-22
START DATE	01/03/92
COMPLETION DATE	01/03/92

WATER LEVELS
4.72 FT (TOC) ON 01/03/92



DEPTH		ELEV.
2.54	TC	628.74
0.00	GS	626.20
0.75	BN	625.45
1.00	SP	625.20
1.00	SC	625.20
11.00	BS	615.20
11.00	TD	615.20

DRILLING SUMMARY

Driller RON JUCKETT
Drilling Fluid AIR
Well Type SINGLE CASED SCREENED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 *inch* *Interval:* 0.00 to 1.00 *ft.*
Type : STAINLESS

Stick Up Inner Casing: 2.54 *ft.* *Protective Casing:* 2.68 *ft.*

Casing Grout: PORTLAND CEMENT *Interval:* 0.00 to 0.75 *ft.*

Seal Type: BENTONITE PELLETS *Interval:* 0.75 to 1.00 *ft.*

Sand Pack Type : # 2 MORIE *Interval:* 1.00 to 11.00 *ft.*
Grain Size : UNIFORM *Median Diameter:*
Screen Diameter: 2.00 *Interval:* 1.00 to 11.00 *ft.*
Type : STAINLESS *Slots:* 0.020 *inches*

Silt Trap Interval: 0.00 to 0.00 *ft.*
Backfill Type : *Interval:* 0.00 to 0.00 *ft.*

WELL DEVELOPMENT

Date 01/03/92
Method Centrifugal Pump
Yield 35 gpm *Purged Volume*

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth
= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:
Well purged of 2100 gallons total

NOTE: Well Diagram not to Scale

Elevations are feet above mean sea level

02/26/92

Borehole Log — *ROY F. WESTON, Inc.*

CLIENT : L. E. CARPENTER		TOTAL DEPTH	: 11.00
SITE NAME : WHARTON ENTERPRISES		LOGGER	: KEN TYSON/WESTON
WELL ID : MW-22		DRILLING COMPANY	: EMPIRE SOILS INVESTIGATIONS
NORTHING : 754213.0900 surveyed		DRILLING RIG	: DRILTECH D40K
EASTING : 2025356.7600 surveyed		DATE STARTED	: 01/03/92
ELEVATION : 626.200 surveyed		DATE COMPLETED	: 01/03/92

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
626	0		25	CLAY and SILT	BROWN	SFT	DRY	5 6 7 5	HNU 0.0	
625	1									
624	2		25	CLAY, sm SILT	GRAY	FRM	MST	8 10 18 25	HNU 0.0	SLIGHT ODOR OF PRODUCT
623	3									
622	4		25	CLAY, lt SILT	GRAY	FRM	WET	32 48 17 7	HNU 0.0	
621	5									
620	6		50	SAND and SILT, sm GRAVEL	GRAY BROWN	SFT	SAT	14 35 39	HNU 5.0	
619	7									
618	8		50	SAND and SILT, sm GRAVEL	GRAY BROWN	LSE	SAT	41 51 68 45	HNU 0.0	
617	9									
616	10			SAND and GRAVEL, sm SILT	GRAY BROWN	LSE	SAT		HNU 0.0	
615	11									
614	12									
613	13									
612	14									
611	15									
610	16									
609	17									
608	18									
607	19									
606	20									

MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(one form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, NJ
NJPDES Permit No. NJ00 or ECRA case No.:

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5 - 3 9 7 6 6
Owner's Well Number (As shown on the application or plans):	MW- 22
Well Completion Date:	1/3/92
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	2.0 ft.
Total Depth of Well to the nearest 1/2 foot:	11.0 ft.
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	1.0 ft.
Screen Length (or length of open hole) in feet:	10.0 ft.
Screen or Slot Size:	0.020 slot
Screen or Slot Material:	Stainless Steel
Casing Material: (PVC, Steel or Other-Specify):	Stainless Steel
Casing Diameter (inches):	2 inches
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	2.0 ft.
Yield (gallons per minute):	10 gpm
Development Technique (specify)	trash pump
Length of Time Well is Developed/ Pumped or Bailed:	1 Hours 0 Minutes
Lithologic Log:	Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Ron Juckett — Name (Type or Print)

Signature

1474 — Certification or License No.

SEAL

Certification by Executive Officer or Duly Authorized Representative

Alexander A. Kiwalle — Name (Type or Print)

Signature

Project Coordinator — Title

2/20/92 — Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATION

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation): 25 - 39766
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74° 34' 30.5"
Latitude (one-tenth of a second): North 40° 54' 15.8"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): ("INNER WELL 2" DIA) 630.64
Owners Well Number (As shown on application or plans): MW-22

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12608
PROFESSIONAL LAND SURVEYOR'S LICENSE #

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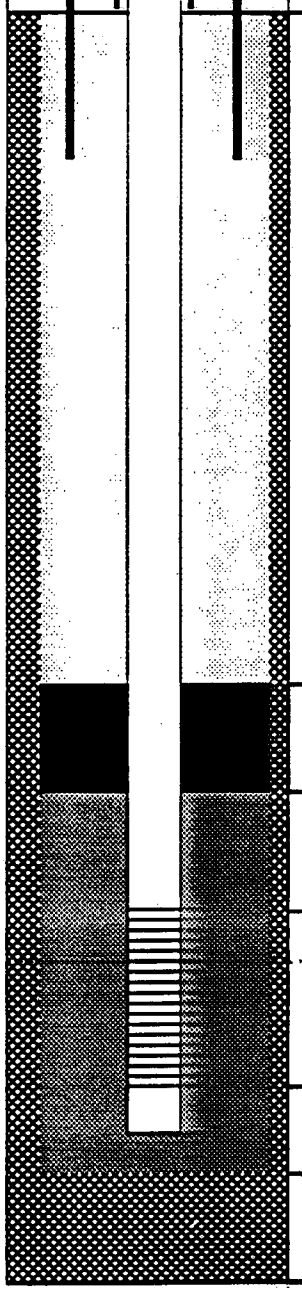
Well Completion Summary

ROY F. WESTON, Inc.

CLIENT	L. E. CARPENTER	*DRILLING FIRM*	EMPIRE SOILS INVESTIGATIONS
SITE NAME	AIR PRODUCTS	*INSPECTOR*	KEN TYSON

WELL ID	MW-23
START DATE	01/06/92
COMPLETION DATE	01/06/92

WATER LEVELS
3.35 FT (TOC) ON 01/06/92



DEPTH		*ELEV.*
1.94	*TC*	630.64
0.00	*GS*	628.70
0.50	*BN*	628.20
0.75	*SP*	627.95
1.00	*SC*	627.70
6.00	*BS*	622.70
6.00	*TD*	622.70

DRILLING SUMMARY

Driller JEFF JAWORSKI
Drilling Fluid AIR
Well Type SINGLE CASED SCREENED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 *inch* *Interval:* 0.00 to 1.00 *ft.*
Type : STAINLESS

Stick Up Inner Casing: 1.94 *ft.* *Protective Casing:* 2.25 *ft.*

Casing Grout: PORTLAND CEMENT *Interval:* 0.00 to 0.50 *ft.*

Seal Type: BENTONITE PELLETS *Interval:* 0.50 to 0.75 *ft.*

Sand Pack Type : # MORIE *Interval:* 0.75 to 6.00 *ft.*
Grain Size : UNIFORM *Median Diameter:*
Screen Diameter: 2.00 *Interval:* 1.00 to 6.00 *ft.*
Type : STAINLESS *Slots:* 0.020 *inches*

Silt Trap Interval: 0.00 to 0.00 *ft.*
Backfill Type : BENTONITE *Interval:* 6.00 to 8.00 *ft.*

WELL DEVELOPMENT

Date 01/07/92
Method Centrifugal Pump
Yield <1 gpm *Purged Volume* 30 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth
= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:

NOTE: Well Diagram not to Scale

Elevations are feet above mean sea level

02/26/92

Borehole Log — *ROY F. WESTON, Inc.*

CLIENT : L. E. CARPENTER		TOTAL DEPTH : 12.00	
SITE NAME : AIR PRODUCTS		LOGGER : KEN TYSON/WESTON	
WELL ID : MW-23		DRILLING COMPANY : EMPIRE SOILS INVESTIGATIONS	
NORTHING : 754424.1560 surveyed		DRILLING RIG : DRILTECH D40K	
EASTING : 2025304.6800 surveyed		DATE STARTED : 01/06/92	
ELEVATION : 628.700 surveyed		DATE COMPLETED : 01/06/92	

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
628	0		50	CLAY, sm SILT	DK BROWN GRAY	SFT	DRY	18 2 15 12	HNU 0.0	
627	1			SAND, sm SILT	BROWN	SFT	MST		HNU 0.0	
626	2		50	SAND, sm SILT	BROWN	LSE	SAT	9 10 8 9	HNU 0.0	WATER AT 2 FT BGS
625	3									
624	4		50	SAND, sm GRAVEL, sm SILT	GRAY BROWN	LSE	SAT	20 9 10 43	HNU 1.0	
623	5									
622	6		75	SAND, sm GRAVEL, lt SILT	GRAY BROWN	LSE	SAT	29 40 34 27	HNU 2.0	
621	7									
620	8			CLAY, lt SILT	GRAY	SFT	MST		HNU 0.0	
			50	CLAY, lt SILT	GRAY	STF	DRY	20 4 6 9	HNU 0.0	
619	9									
618	10		50	GRAVEL, sm SAND, lt SILT	GRAY BROWN	LSE	SAT	18 14 16 35	HNU 4.0	HNU READING IS MOST LIKELY WATER
617	11									
616	12									
615	13									
614	14									
613	15									
612	16									
611	17									
610	18									
609	19									
608	20									

MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(one form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, NJ
NJPDES Permit No. NJ00 or ECRA case No.:

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5 - 3 9 7 6 7
Owner's Well Number (As shown on the application or plans):	MW- 23
Well Completion Date:	1/6/92
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	2.5 ft.
Total Depth of Well to the nearest 1/2 foot:	6.0 ft.
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	1.0 ft.
Screen Length (or length of open hole) in feet:	5.0 ft.
Screen or Slot Size:	0.020 slot
Screen or Slot Material:	Stainless Steel
Casing Material: (PVC, Steel or Other-Specify):	Stainless Steel
Casing Diameter (inches):	2 inches
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	2.4 ft.
Yield (gallons per minute):	n/a
Development Technique (specify)	not developed
Length of Time Well is Developed/ Pumped or Bailed:	0 Hours 0 Minutes
Lithologic Log:	Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Jeff Jaworski — Name (Type or Print)

Signature

1315 — Certification or License No.

SEAL

Certification by Executive Officer or Duly Authorized Representative

Alexander A. Kiwalle — Name (Type or Print)

Signature

Project Coordinator — Title

2/20/92 — Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATION

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation: 25 - 3 9 7 6 7
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74° 34' 31.4"
Latitude (one-tenth of a second): North 40° 54' 16.0"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): (INNER WELL 2" DIA.) 629.03
Owners Well Number (As shown on application or plans): MW-23

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to be a major modification of the NJPDES permit.

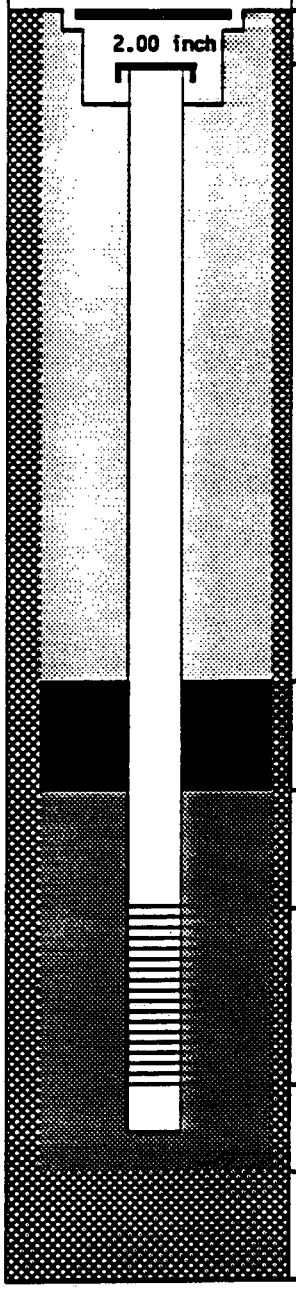
Well Completion Summary

ROY F. WESTON, Inc.

CLIENT	L. E. CARPENTER	*DRILLING FIRM*	EMPIRE SOILS INVESTIGATIONS
SITE NAME	AIR PRODUCTS	*INSPECTOR*	BRUCE BABCOCK

WELL ID	MW-24
START DATE	01/07/92
COMPLETION DATE	01/07/92

WATER LEVELS
2.94 FT (TOC) ON 01/07/92



	DEPTH		*ELEV.*
Flush Mount Cover	0.00	*GS*	629.17
2.00 inch	-0.14	*TC*	629.03
	1.00	*BN*	628.17
	1.50	*SP*	627.67
	2.00	*SC*	627.17
	7.00	*BS*	622.17
	7.00	*TD*	622.17

DRILLING SUMMARY

Driller RON JUCKETT
Drilling Fluid AIR
Well Type SINGLE CASED SCREENED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 *inch* *Interval:* 0.00 to 2.00 *ft.*
Type : STAINLESS

Top of Inner Casing Depth: -0.14 *ft.*

Casing Grout: PORTLAND CEMENT *Interval:* 0.00 to 1.00 *ft.*

Seal Type: BENTONITE PELLETS *Interval:* 1.00 to 1.50 *ft.*

Sand Pack Type : #2 MORIE *Interval:* 1.50 to 7.00 *ft.*
Grain Size : UNIFORM *Median Diameter:*

Screen Diameter: 2.00 *Interval:* 2.00 to 7.00 *ft.*
Type : STAINLESS *Slots:* 0.020 *inches*

Silt Trap Interval: 0.00 to 0.00 *ft.*
Backfill Type: *Interval:* 0.00 to 0.00

WELL DEVELOPMENT

Date 01/07/92
Method Centrifugal Pump
Yield <1 gpm *Purged Volume* 20 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:

NOTE: Well Diagram not to Scale

Elevations are feet above mean sea level

03/03/92

Borehole Log — *ROY F. WESTON, Inc.*

CLIENT : L. E. CARPENTER		TOTAL DEPTH	: 12.00
SITE NAME : AIR PRODUCTS		LOGGER	: BRUCE BABCOCK/WESTON
WELL ID : MW-24		DRILLING COMPANY	: EMPIRE SOILS INVESTIGATIONS
NORTHING : 754442.7500 surveyed		DRILLING RIG	: DRILTECK D40K
EASTING : 2025232.5100 surveyed		DATE STARTED	: 01/07/92
ELEVATION : 629.170 surveyed		DATE COMPLETED	: 01/07/92

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
628	1		50	SAND, sm SILT, sm GRAVEL	ORANGE BROWN	LSE	DRY	10 8 7	HNU 0.0	
627	2		50	SAND, sm GRAVEL, sm SILT	ORANGE BROWN	LSE	WET	8 11 12 14	HNU 0.0	WATER AT 3 FT BGS
626	3									
625	4		50	SAND, sm GRAVEL, lt SILT	ORANGE BROWN	LSE	SAT	15 12 14 12	HNU 0.0	
624	5									
623	6		50	SAND, sm GRAVEL	YELLOW BROWN	LSE	SAT	25 37	HNU 0.0	
622	7									
621	8		100	SAND, sm GRAVEL	YELLOW BROWN	LSE	SAT	41 38 37	HNU 0.0	
620	9									
619	10			CLAY, sm SILT, lt SAND	LIGHT GRAY	FRM	SAT		HNU 0.0	
				SAND, sm CLAY, sm SILT, l-	ORANGE BROWN	LSE	SAT		HNU 0.0	
			100	SAND, sm CLAY, lt GRAVEL, lt SILT	YELLOW BROWN	SFT	SAT	25 31 46	HNU 0.0	
618	11									
617	12									
616	13									
615	14									
614	15									
613	16									
612	17									
611	18									
610	19									
609	20									

MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(one form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, NJ
NJPDES Permit No. NJ00 or ECRA case No.:

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5 - 3 9 7 6 8
Owner's Well Number (As shown on the application or plans):	MW- 24
Well Completion Date:	1/3/92
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	0 ft.
Total Depth of Well to the nearest 1/2 foot:	7.0 ft.
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	2.0 ft.
Screen Length (or length of open hole) in feet:	5.0 ft.
Screen or Slot Size:	0.020 slot
Screen or Slot Material:	Stainless Steel
Casing Material: (PVC, Steel or Other-Specify):	Stainless Steel
Casing Diameter (inches):	2 inches
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	2.0 ft.
Yield (gallons per minute):	112 gpm
Development Technique (specify)	Trash pump
Length of Time Well is Developed/ Pumped or Bailed:	3 Hours 0 Minutes
Lithologic Log:	Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Ron Juckett — Ron Juckett
Name (Type or Print) — Signature

1474
Certification or License No. — SEAL

Certification by Executive Officer or Duly Authorized Representative

Alexander A. Kiwalle — Alexander A. Kiwalle
Name (Type or Print) — Signature

Project Coordinator — 2/20/92
Title — Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATION

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation): 25-397768
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74° 34' 31.3"
Latitude (one-tenth of a second): North 40° 54' 13.7"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): (INNER WELL 2" DIA.) 628.74
Owners Well Number (As shown on application or plans): MW-24

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to be a major modification of the NJPDES permit.

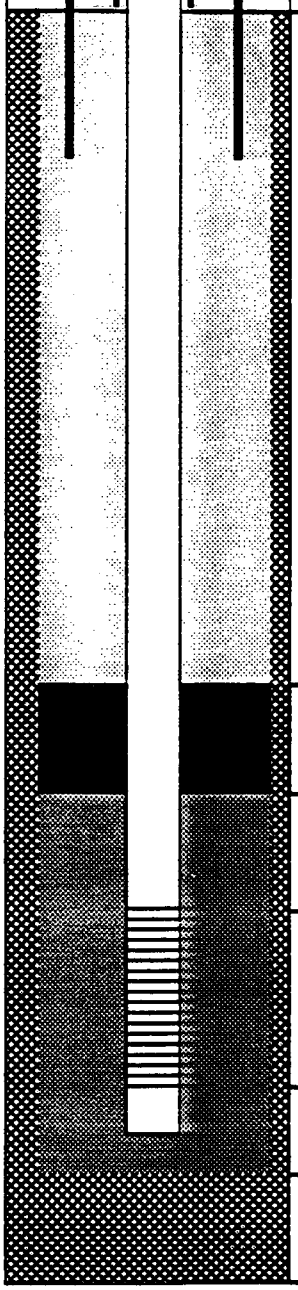
Well Completion Summary

ROY F. WESTON, Inc.

CLIENT	L. E. CARPENTER	*DRILLING FIRM*	EMPIRE SOILS INVESTIGATIONS
SITE NAME	L.E. CARPENTER,3600-	*INSPECTOR*	KEN TYSON

WELL ID	MW-25
START DATE	02/05/92
COMPLETION DATE	02/05/92

WATER LEVELS
2.00 FT (TOC) ON 02/05/92



DEPTH		*ELEV.*
1.73	*TC*	627.33
0.00	*GS*	625.60
0.50	*BN*	625.10
1.00	*SP*	624.60
1.00	*SC*	624.60
11.00	*BS*	614.60
11.00	*TD*	614.60

DRILLING SUMMARY

Driller JEFF JOWORSKI
Drilling Fluid NONE
Well Type SINGLE CASED SCREENED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 *inch* *Interval:* 0.00 to 1.00 *ft.*
Type : STAINLESS

Stick Up Inner Casing: 1.73 *ft.* *Protective Casing:* 2.06 *ft.*

Casing Grout: PORTLAND CEMENT *Interval:* 0.00 to 0.50 *ft.*

Seal Type: BENTONITE *Interval:* 0.50 to 1.00 *ft.*

Sand Pack Type : MORRIE #2 *Interval:* 1.00 to 11.00 *ft.*
Grain Size : UNIFORM *Median Diameter:* .84 mm
Screen Diameter: 2.00 *Interval:* 1.00 to 11.00 *ft.*
Type : STAINLESS *Slots:* 0.020 *inches*

Silt Trap Interval: 0.00 to 0.00 *ft.*
Backfill Type : COLLAPSE *Interval:* 11.00 to 16.00 *ft.*

WELL DEVELOPMENT

Date 02/05/92
Method TEEL PUMP
Yield 5 gpm *Purged Volume* 150 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:

NOTE: Well Diagram not to Scale

Elevations are feet above mean sea level

02/26/92

Borehole Log — *ROY F. WESTON, Inc.*

CLIENT : L. E. CARPENTER		TOTAL DEPTH	: 16.00
SITE NAME : L.E. CARPENTER,3600-06-21		LOGGER	: KEN TYSON, ROY F. WESTON
WELL ID : MW-25		DRILLING COMPANY	: EMPIRE SOILS INVESTIGATIONS
NORTHING : 754203.7600 surveyed		DRILLING RIG	: CME 850, TRACK MOUNTED
EASTING : 2025356.7600 surveyed		DATE STARTED	: 02/05/92
ELEVATION : 625.600 surveyed		DATE COMPLETED	: 02/05/92

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
624	1		75	CLAY	GRAY/YELLOW	STF	DRY	14 6 20	HNU 0.0	stiff clay
623	2		25	CLAY	GRAY/YELLOW	STF	DRY	16 6 10 5	HNU 0.0	
622	3									
621	4			No Sample Recovered				14 10 14 8	HNU 0.0	no recovery
620	5									
619	6		25	CLAY, tr SAND, tr SILT	GRAY	SFT	SAT	16 8 10 12	HNU 0.0	
618	7									
617	8		83	SAND, lt GRAVEL, lt SILT	GRAY/BROWN	FRM	SAT	14 16 16 28	HNU 0.0	
616	9									
615	10		100	SAND, lt SILT, lt GRAVEL	GRAY	LSE	SAT	22 20 15 9	HNU 0.0	
614	11									
613	12		100	SAND, lt SILT, lt GRAVEL	GRAY	LSE	SAT	40 14 24 28 10	HNU 0.0	
612	13									
611	14		100	SAND, lt SILT, tr GRAVEL	GRAY	LSE	SAT	25	HNU 0.0	
610	15									
609	16									
608	17									
607	18									
606	19									
605	20									

MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(one form must be completed for each well)

Name of Permittee: L.E. Carpenter
Name of Facility: L.E. Carpenter
Location: Wharton, NJ
NJPDES Permit No. NJ00 or ECRA case No.:

MAR 2 1992

CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation:	2 5 - 4 0 4 5 1
Owner's Well Number (As shown on the application or plans):	MW- 25
Well Completion Date:	2/5/92
Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot):	2.0 ft.
Total Depth of Well to the nearest 1/2 foot:	11.0 ft.
Depth to Top of Screen From Top of Casing (one-hundredth of a foot):	1.0 ft.
Screen Length (or length of open hole) in feet:	10.0 ft.
Screen or Slot Size:	0.020 slot
Screen or Slot Material:	Stainless Steel
Casing Material: (PVC, Steel or Other-Specify):	Stainless Steel
Casing Diameter (inches):	2 inches
Static Water Level From Top of Casing at the Time of Installation (one-hundredth of a foot):	1.5 ft.
Yield (gallons per minute):	5.0 gpm
Development Technique (specify)	Trash pump
Length of Time Well is Developed/ Pumped or Bailed:	0 Hours 30 Minutes
Lithologic Log:	Attach

Authentication

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Jeff Jaworski — Name (Type or Print)

Jeff Jaworski — Signature

1315 — Certification or License No.

SEAL

Certification by Executive Officer or Duly Authorized Representative

Alexander A. Kiwalle — Name (Type or Print)

A A Kiwalle — Signature

Project Coordinator — Title

2/20/92 — Date

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION-FORM B-LOCATION CERTIFICATION

Name of Permittee:
Name of Facility:
Location:
NJPDES Number:

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Bureau of Water Allocation): 25-704511
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West 74°34'29.8"
Latitude (one-tenth of a second): North 40°54'13.7"
Elevation of Top of Casing (cap off) (one-hundredth of a foot): (INNER WELL 2" DIA) 627.33
Owners Well Number (As shown on application or plans): MW-25

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

PROFESSIONAL LAND SURVEYOR'S SIGNATURE

KEITH W. CONDIT
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

12808
PROFESSIONAL LAND SURVEYOR'S LICENSE #

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APPENDIX B

CULTURAL RESOURCE SURVEY

A STAGE IA ARCHEOLOGICAL SURVEY
OF
THE L.E. CARPENTER & COMPANY PROPERTY
Wharton Borough, Morris County, New Jersey

JOHN MILNER ASSOCIATES
ARCHITECTS • ARCHEOLOGISTS • PLANNERS

A STAGE IA ARCHEOLOGICAL SURVEY
OF
THE L.E. CARPENTER & COMPANY PROPERTY
Wharton Borough, Morris County, New Jersey

prepared for

L. E. Carpenter & Company
c/o M. A. Hanna Company
1301 East Ninth Street, Suite 3600
Cleveland, OH 44114

and

Roy F. Weston, Inc.
Raritan Plaza #1, 4th Floor
Raritan Center
Edison, NJ 08837

by

John P. McCarthy
Thomas A. J. Crist

John Milner Associates, Inc.
309 North Matlack Street
West Chester, PA 19380

1991

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ABSTRACT

A Stage IA archeological survey was conducted at the L. E. Carpenter & Company property in the Borough of Wharton, Morris County, New Jersey. The project area is located in the northwest section of Wharton, adjacent to Washington Forge Pond. The survey included a literature and historical map review, a pedestrian reconnaissance of the project area, and preparation of this report documenting the methods, results, conclusions, and recommendations of the investigation. It is concluded that the project area has moderate potential to contain buried prehistoric archeological resources, most likely associated with Native American use of the area during the Archaic Period (c. 8000 - 1000 BC). Additionally, Building 2 on the property, the c. 1889 Ross and Baker Silk Mill, has considerable potential to constitute a significant archeological resource.

It is recommended that portions of the L. E. Carpenter & Company property which may be slated for ground-disturbing activities be subject to a Stage IB level archeological survey including mechanically-assisted deep testing to assess the presence and integrity of native soils and to confirm the presence or absence of prehistoric archeological resources in such soils. In addition, the former Ross and Baker Silk Mill should be the subject of a detailed historic and archeological Stage II evaluation of its integrity and potential to provide significant information concerning the development and evolution of the silk industry in New Jersey.

1.0 INTRODUCTION

1.1 Purpose and Goals of the Investigation

John Milner Associates, Inc. (JMA) was retained to conduct a Stage IA archeological survey of the L. E. Carpenter & Company property to evaluate the sensitivity of the parcel for potentially significant archeological resources. The survey was conducted in compliance with legislation and implementing regulations requiring federal agencies (and/or their designees) to identify significant cultural resources (including archeological sites) and to take into account the possible effects of federally funded, licensed, or approved activities on such resources. These mandates include Section 106 of the National Historic Preservation Act, as amended, and the National Environmental Policy Act.

In accordance with the EPA's *CERCLA Compliance with Other Laws Manual: Part II*, this Stage IA archeological survey includes a literature and historical map review to identify known or potential cultural resources in the project area and its vicinity; a pedestrian reconnaissance of the project area to determine conditions that may have affected the presence and/or integrity of the archeological resources; and preparation of this report documenting the methods, results, conclusions, and recommendations of the Stage IA archeological survey.

1.2 Location and Description of the Project Area

The L. E. Carpenter & Company property is located approximately one half mile north of the center of Wharton Borough in Morris County, New Jersey (Figure 1). The project area consists of an irregularly shaped parcel occupying approximately 14.6 acres in the industrial area of Wharton, bounded on the south by the Rockaway River, on the west by Washington Forge Pond, on the north by a compressed gas facility and Ross Street, and on the east by a vacant lot (Figure 2). Approximately 15 percent of the area is occupied by extant buildings (Weston 1991).

A portion of North Main Street transverses the property's southwest corner, with the intersection of North Main Street and Ross Street located at the northwest corner of the property. A railroad right-of-way bisects the property and crosses the Rockaway River south of the project area.

1.3 Organization of the Report

This report is comprised of five sections of text and a list of references cited. Section 1.0, the introduction, describes the purpose and goals of the investigation, the location and description of the project area, and the organization of the report. The results of background research are then discussed in Section 2.0, including information on the project area's environmental setting, prehistory, and history. The methods and results of the pedestrian reconnaissance are then presented in Section 3.0. Section 4.0 presents an assessment of the project area's archeological sensitivity. The last section, Section 5.0, provides a summary of the Stage IA investigations and presents appropriate recommendations. Figures and plates are included following the list of references cited. Appendix A (Qualifications of the Investigators) completes the report.

2.0 BACKGROUND RESEARCH

This section of the report provides the results of the background research concerning the project area and its vicinity. A variety of sources was examined, including prehistoric site records and cultural resources survey reports, volumes on local prehistory and history, and historic maps. Repositories consulted included the New Jersey State Museum and the New Jersey State Library, the Office of New Jersey Heritage, the Morris County Public Library, the Morris County office of the U.S. Soil Conservation Service, and the Borough of Wharton Public Library. Individuals with knowledge of the environment, prehistory and history of the project area were also consulted. Three topics are addressed in this section of the report: 1) environmental setting of the project area, 2) prehistoric occupation of the project vicinity, and 3) historic occupation of the project area and vicinity.

2.1 Environmental Setting of the Project Area

The majority of the project area lies within the 100-year floodplain of the Rockaway River near the center of the Highland Physiographic Province of northern New Jersey (Figure 3). The topography of the Highland Province is comprised of hills, mountains, and lakes, interspersed with numerous marshes (Marshall 1982). The L. E. Carpenter & Company property is situated in the center of the Dover Magnetite District, an active mining area that produced over 26 million tons of iron ore prior to 1940.

The project area has an average depth to bedrock of 165 feet with a 45-foot depth near the river. Granite bedrock is covered with overlying unconsolidated sediments of glacio-fluvial and recent fluvial origin. Project area soils are composed of fine to coarse sand and fine to medium gravel with little silt, and numerous cobbles and boulders. Fill is also present and includes concrete, debris, asphalt, ash, and tailings from the former mines that operated in the

area through the turn of the twentieth century (Weston Services 1991). The project area is primarily classified as Urban Land by the Soil Conservation Service, surrounded by Ridgebury loam, Rockaway stony loam, and Whitman stony loam (U.S. Department of Agriculture 1974). The Rockaway River is a southern branch of the Passaic River, and flows southeast across the Highland Ridges (Vermeule 1894). It supplies the Washington Forge Pond, which comprises approximately 10 acres and forms the western border of the project area.

2.2 Prehistoric Occupation of the Project Vicinity

Human occupation in the region begins with the Paleo-Indian period (c. 10,000 B.C.-6000 B.C.). In the New Jersey Highlands this time was marked by low to medium densities of caribou, deer, fish, and mastodon (Marshall 1982). Deposits from the Wisconsin Terminal Moraine and other glacial episodes probably provided secondary sources of chert for the Paleo-Indian tool assemblage. Fifteen fluted Paleo-Indian projectile points have been recovered in the Highlands Province, with six of the points discovered in Morris County (Marshall 1982:26).

The New Jersey Highlands offered an attractive environment to transitory bands of Native Americans in the Archaic period (c. 8000 B.C.-1000 B.C.). During the Archaic period, marshlands, hilltops, and riverine rock shelters were significant loci for small campsites, which were usually centered around ponds and springs (Kraft and Mounier 1982a). Kraft observes that "[Early Archaic] sites are usually found along river floodplains; hence they may be deeply buried under alluvium. Such sites are usually well preserved and stratified...[However] early man sites formerly on or near rivers may have been destroyed or abandoned as the rivers cut new channels" (Kraft and Mounier 1982a:71).

Native American occupation of the Highlands Province diminished during the Woodland Periods (c. 1000 B.C.-A.D. 1600), probably as a result of Native American sedentism and the

gradual change from hunting and gathering to cultivation. By the Late Woodland Period (c. A.D. 1000-1600) settlements are virtually unknown in the Highlands Province, suggesting that prehistoric populations used the region in a transitory manner during this time period (Kraft and Mounier 1982b).

Skinner and Schrabish (1913) reported no prehistoric sites in or near the project area in their early twentieth century overview archeological survey of the state. Moreover, the archeological site files of the New Jersey State Museum also include no sites within one mile of the project area, although no systematic surveys have been conducted in the immediate vicinity of the project area.

2.3 Historic Occupation of the Project Vicinity

Morris County was part of Hunterdon County until 1739, when it was incorporated as a separate political body. In March of 1740, Morris County was divided into Pequannock, Hanover, and Morris Townships. In 1844, Rockaway Township was formed from Pequannock and Hanover Townships, and it was from this tract and an adjoining parcel in Randolph Township (incorporated in 1806) that the present Borough of Wharton was formed. From 1868 to 1902, the town was known as Port Oram. In 1902, it was renamed the Borough of Wharton, recognizing Joseph Wharton, the industrialist who employed most of the inhabitants of the area at that time (Hance 1911; Snyder 1969).

The project vicinity has supported a variety of industrial uses, including forges in the late eighteenth and early nineteenth centuries, iron mines and furnaces throughout the nineteenth century, and silk mills, glassworks, and a wall covering factory during the twentieth century. The majority of the residents moved into the region to work the mines and furnaces; these families were primarily of Irish, Welsh, Cornish, and Hungarian descent (Acroterion 1987).

Washington Forge Pond, located immediately west of the project area, was named with reference to the Washington Forge, which was built in 1795 by Charles Hoff, Jr. and his brother-in-law Joseph DeCamp. Located on the West Branch of the Rockaway River, the forge consisted of two fires, and was in operation until about 1816, when it was purchased by Israel Canfield and Company (Boyer 1963). The property then passed to Henry McFarlan, the landowner depicted on the Lightfoot and Geil 1853 map of Morris County (Figure 4).

The main impetus for the founding of Wharton was the construction of the Morris Canal in 1831. Over 100 miles long, the canal connected Jersey City with the Delaware River, linking Pennsylvania's Lehigh Valley to New York markets (Vermeule 1894). With the coming of the Morris and Essex Railroad during the 1850s, the project vicinity was tied into the main regional transportation routes, and its proximity to the Hibernia Range, which contained excellent Bessemer ores, made it especially attractive for iron mining.

Port Oram began as a depot for the Delaware, Lackawanna and Western Railroad, and took its name from Robert F. Oram, a Cornish mine supervisor who came to the area in 1848 (Acroterion 1987; Yates 1987). By 1868, Port Oram was a town comprising 40 structures serving a population of 400. The Beers 1868 *Atlas of Morris County* depicts Port Oram as a small community outside of Dover, with only four listings in its business directory.

Between 1868 and 1887, Port Oram expanded as the number of mines and furnaces in the area increased. With the exception of the economic depression of the 1870s, the last quarter of the nineteenth century was a time of prosperity for the New Jersey iron industry. A number of mines opened in the northern and western sections of Port Oram, including the Hurd Mine, the Orchard Mine, and the Huff Mine (Acroterion 1987). Two mines were located on the L. E. Carpenter & Company property, each with two mine shafts (Figure 5). The first, the

Washington Forge Mine, opened in 1868 and was worked until 1875 when it was closed due to excessive mine water (New Jersey Department of Labor and Industry 1978). It reopened in 1879 after the "Irondale adit", an underground tunnel emptying into the Rockaway River, drained the mine. It closed permanently in 1881. At the time it was abandoned, the Washington Forge Mine was about 250 feet long and had an average depth of 200 feet. It produced an estimated 50,000 tons of ore during its operation.

The second mine on the L. E. Carpenter & Company property was the West Mt. Pleasant Mine, located 170 feet northeast of the Washington Forge Mine. The West Mt. Pleasant Mine consisted of a 300 foot inclined shaft designed to extract ore from the northeast continuation of the Mt. Pleasant deposits. This mine was presumably closed when the Washington Forge Mine closed in 1881 (New Jersey Department of Labor and Industry 1978).

Other iron-related industries in the project vicinity include the Port Oram Iron Company, founded in 1868. The firm was profitable for a number of years, and was leased by Ario Pardee in 1872. Its furnace closed during the recession of 1873, and in 1877 the company went bankrupt. Purchased by its bondholders, it was reorganized as the Port Oram Furnace Company, but it too failed. In 1881, Joseph Wharton, a Quaker industrialist from Pennsylvania, purchased the furnace, and returned it to production (Yates 1987). In 1882 the production of New Jersey iron ore reached a high of 932,762 tons, but soon thereafter a flood of low-cost ores from the Midwest flooded the market and the New Jersey iron industry collapsed. By 1885 the tonnage mined had dropped to a third of the 1882 level. Most of the New Jersey mines closed, although by 1890 statewide production had recovered to about half of the 1882 yield (Yates 1987).

The 1887 Robinson *Atlas of Morris County* devotes a separate page to the depiction of Port Oram, indicating its growth as a community separate from Dover (Figure 6). The only structure depicted in the project area at that time is an engine house and an outbuilding, presumably serving the Central Railroad of New Jersey, the tracks of which crossed the Rockaway River at that point. Washington Forge Pond, depicted as part of the Rockaway River, was at one time called Castner's Pond, in reference to Castner's General Store, which was located next to the pond. Now occupied by the Sussex Meat Packing Company, the current building was constructed in 1911 and is included in the Historic Sites Survey of Wharton (Acroterion 1987:1439-003).

In addition to taking over the Port Oram Furnace Company, Joseph Wharton also purchased much of the land in the center of Port Oram, and soon became the principal landowner in the area. A worker's community was planned for the area of northeast Port Oram between the Rockaway River and the Morris and Essex Railroad tracks; this development was never realized, however, as the market in pig iron remained unstable through the turn of the century. Wharton made the furnace at Port Oram the center of his operations in New Jersey, and in 1889 modernized his Port Oram plant (Yates 1987).

By 1899 Joseph Wharton was the largest miner of iron ore in New Jersey. After the turn of the twentieth century, the pig iron market became extremely unstable, and by 1902 all independent mines in New Jersey had closed; only those connected with blast furnaces, such as Wharton's Port Oram operation, remained open. Between 1900 and 1905 Wharton purchased the New Jersey Iron Mine Company in Port Oram, and became the nation's largest manufacturer of pig iron and the foremost authority on its production (Yates 1987). Port Oram seceded from Randolph and Rockaway Townships in 1895, and in 1902 was renamed in honor of Joseph

Wharton. By the 1920s iron production in New Jersey had markedly declined, and the Morris Canal was abandoned. In 1932 the iron furnace at Wharton was dismantled.

In the midst of the erratic fortunes of the iron industry, other commercial ventures came to the Port Oram/Wharton area. With four railroad lines passing through the area, clothing manufacturers found Wharton to be an ideal location for their factories. Oram Hance and Company opened one of the first silk mills in Port Oram, south of the project area. It is depicted as the only silk mill in Port Oram on the 1887 plan of the area (Figure 6). As the turn of the century approached, other clothing manufacturers had moved into the area; the Ross and Baker Company silk mill factory and associated buildings (opened in 1889) were depicted in 1897 on a portion of the present L. E. Carpenter & Company property (Figure 7). The 1901 Sanborn map of the project area shows that the name of the silk manufacturer had changed to E. J. Ross, and that a second mill building had been erected across the County Road (now North Main Street) from the main building (Figure 8). By 1916 E. J. Ross was out of business, and the two factories occupied by the Ross company were vacant. The Singleton Silk Manufacturing Company still owned the buildings west of North Main Street, which were then being used by the Wharton Textile Company (Figure 9). Also by 1916 the street north of the project site was named Ross Street, presumably after the company occupying the site. Ross Street is listed in the Wharton Historic Sites Survey as being architecturally significant for containing a row of three "typically Wharton houses which retain, for the most part, their original building materials" (Acroterion 1987:1439-004).

The 1927 Sanborn map shows the L. E. Carpenter & Company property as including the original Baker and Ross buildings with additional structures, then under the ownership of Onyx Hosiery Incorporated, a manufacturer of silk stockings (Figure 10). The main buildings north of North Main Street were used for manufacturing and storage, while the former E. J. Ross

building south of North Main Street contained offices and a packing facility. By 1939 L. E. Carpenter and Company had moved onto the site; the long row of storage buildings adjacent to the main Baker and Ross factory were removed and additional structures were built on the west side of North Main Street, south of Ross Street (Figure 11). L. E. Carpenter and Company produced wall coverings. Several of the buildings depicted on the Sanborn maps of the area remain in the current complex (Figure 2), including the original Ross and Baker Company silk mill factory building, depicted on the 1897 Sanborn map (Figure 7).

3.0 PEDESTRIAN RECONNAISSANCE

The senior author of this report conducted a pedestrian reconnaissance of the L. E. Carpenter & Company property. This section of the report provides a description of the methods and results of the pedestrian reconnaissance of the project area.

3.1 Methods

Mr. John P. McCarthy visited the project area on August 29, 1991. While on-site Mr. McCarthy was accompanied by a representative of Roy F. Weston, Inc. (Weston). Level D personal protection was maintained throughout the visit. The pedestrian reconnaissance included an examination of the existing conditions at the L. E. Carpenter & Company property and documentation of its terrain and man-made alterations. Conditions affecting the presence and integrity of potential archeological resources within the project area were noted. Exposed ground surfaces were examined for evidence of archeological deposits. Significant characteristics observed during the survey were noted and photographed (Plates 1-12).

3.2 Results

The L. E. Carpenter & Company property includes a number of extant structures which appear to have been built at various times over approximately the last 100 years (Figure 2; Plates 1-4). Building 16 appears to be of relatively recent construction (Plate 1), while buildings 8-9 and 13-14 (Plates 2 and 3) appear to have been constructed earlier. Building 2 appears to be the 1889 Ross and Baker silk mill, although it has been subject to extensive exterior alteration (Plate 4).

The former Ross and Baker mill is located at the mouth of Washington Forge Pond (Figure 2). A dam extends to the west-northwest from the mill building, forming the pond (Figure 2; Plates

5 and 6). A head gate providing water power to the mill is located at the junction of the dam and mill building (Plate 7). In addition, remains of a tail race containing a steel penstock are extant east of the mill (Figure 2).

Other features of the property include a cement-lined pit which once housed chemical storage tanks (Figure 2; Plate 8). Large areas of the property are vacant of structures, where bare soil incorporating rubble fill is visible (Plate 9), or are paved or maintained as lawn (Plates 1, 3, and 5). No artifacts or other evidence of archeological resources were observed on exposed ground surfaces.

Adjacent historic properties include possible mill worker houses to the south across the Rockaway River from the project area (Plate 10). Despite considerable modernizations, several of these structures appear to date from the nineteenth century. However, none were included in the Historic Sites Survey of Wharton (Acroterion 1987). Historic properties mentioned in the Historic Sites Survey include the Ross Street Houses directly across the street from the project area (Plate 11), and Castner's General Store, now the Sussex Meat Packing Company, on North Main Street, adjacent to the intersection of Ross and North Main Streets (Plate 12).

4.0 ASSESSMENT OF ARCHEOLOGICAL SENSITIVITY

The vicinity of the project area has a long history of human occupation, and the project area itself has been subject to repeated human use and modification of various kinds. While nearly all human activity produces some physical evidence of that activity, not all evidence is of equal value in reconstructing past lifeways and cultural processes. For an archeological resource to be capable of providing significant information concerning life in the past, it must contain material of sufficient density, variety, and spatial integrity to permit behavioral interpretation. This section of the report assesses the archeological potential of the project area based on the documentary and field data collected in the course of the investigation. Historic and prehistoric archeological resources are each addressed.

While Washington Forge was established in the project area in the late eighteenth century, historic documentation indicates that the project area was extensively developed during the second half of the nineteenth century. Iron ore mining took place through the turn of the century, and the project area was then the site of silk manufacturers until the late 1930s. The industrial use of the property continued until recently. Extensive industrial development, use, and redevelopment of the property are likely to have disturbed or perhaps destroyed archeological resources associated with earlier industrial activities. The c. 1889 Ross and Baker Silk Mill stands on the site of the forge. The existing dam was constructed at that time, resulting in an increase in the size of Washington Forge Pond (Edward Griffin 1991, pers. comm.). In addition, the adjacent early twentieth century properties on Ross Street and North Main Street are unlikely to have resulted in the deposition of significant refuse within the project area. Accordingly, historic archeological resources in the project area are most likely limited to those associated with the Ross and Baker Silk Mill. The silk mill and related

features, including the dam and races, have considerable potential to constitute a significant archeological resource.

The L. E. Carpenter & Company property possesses moderate potential to contain prehistoric archeological resources, most likely associated with the seasonal use of the project area's riverine environment by Native Americans during the Archaic Period (c. 8000 - 1000 BC). In addition, evidence of Native American settlement during the Paleo-Indian (c. 10,000 - 6000 BC) and portions of the later Woodland Periods (c. 1000 BC - AD 1600) in Morris County suggests that transitory occupation may also have taken place in the project area. Such prehistoric activity may have resulted in archeological resources sealed in undisturbed soils which may be buried beneath fill and disturbed soils across the entire project area.

Roy F. Weston, Inc. (Weston) has made information available concerning the documented extent of prior ground disturbance to the L. E. Carpenter & Company property. This data included test pit and boring logs associated with hazardous waste remediation investigations conducted on the property by various consultants. Review of this information with Weston personnel indicated that the portion of the project area to the southeast of the railroad right-of-way which divides the property appears to contain fill and disturbed soils to a minimum depth of five (5) feet below the current ground surface. To the northeast of the railroad right-of-way, fill and disturbed soils appear to be present to a minimum depth of two (2) feet below the extant ground surface. It is thus possible that undisturbed prehistoric archeological resources are preserved below the fill and disturbed soils on the L.E. Carpenter & Company property.

5.0 SUMMARY AND RECOMMENDATIONS

5.1 Summary

A Stage IA archeological survey was conducted for the L. E. Carpenter & Company property in Wharton, New Jersey. The investigation included a literature and historical map review to identify known or potential archeological and historical resources and a pedestrian reconnaissance of the project area to observe conditions that may have affected the presence and/or integrity of archeological resources. Based on the data collected, it is concluded that the project area has moderate potential for prehistoric archeological resources in areas where fill and disturbed soils may have sealed undisturbed native soils containing archeological deposits. In addition, Building 2 on the property, the c. 1889 Ross and Baker Silk Mill, has considerable potential to constitute a significant historic archeological resource.

5.2 Recommendations

Since the entire project area possesses moderate potential for prehistoric archeological resources, it is recommended that ground-disturbing activities on the L. E. Carpenter & Company property which will affect soils below the depth of two (2) feet in the portion of the property northwest of the railroad right-of-way and below five (5) feet in the portion of the property to the southeast of the railroad right-of-way be preceded by a Stage IB level archeological survey. Such a survey should include mechanically-assisted deep testing to assess the presence and integrity of native soils below the level of apparent disturbance and to confirm the presence or absence of prehistoric archeological resources in such soils. Prior to such testing hazardous materials risks should be evaluated and an appropriate health and safety plan developed. In addition, if the former Ross and Baker Silk Mill will be affected by remedial activities, it should be the subject of a detailed historic and archeological Stage II evaluation of its integrity and potential to provide significant information concerning the

development and evolution of the silk industry in New Jersey. Such an evaluation most likely will not require subsurface testing since most important features of the complex are visible on the surface. However, the mill and related features should be carefully examined and recorded.

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Roy F. Weston, Inc. (Weston)

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APPENDIX A: QUALIFICATIONS OF THE INVESTIGATORS

THOMAS A.J. CRIST
Project Archeologist/Osteologist

EDUCATION

B.A.	Rutgers College, Rutgers University	New World Archeology	1987
M.A.	University of South Carolina	Anthropology/Public Service Archeology	1990
Ph.D.	Temple University	Biological Anthropology	enrolled

PROFESSIONAL CERTIFICATION

Society of Professional Archeologists; Certified in: Field Research, Archeometric and Natural Science Research, and Historical Archeology

EXPERIENCE PROFILE

Mr. Crist joined John Milner Associates, Inc. (JMA) to direct the osteological analysis of skeletal remains recovered from the Tenth Street First African Baptist Church cemetery. Prior to joining JMA, Mr. Crist was the assistant to the South Carolina State Forensic Anthropologist, and is currently the Forensic Anthropologist for the City of Philadelphia. He is also on the faculty at the National Museum of Health and Medicine/Armed Forces Institute of Pathology in Washington, D.C. He has analyzed over two hundred skeletons and conducted numerous forensic autopsies. Mr. Crist has also participated in a variety of archeological projects, and has taught field archeology courses in New Jersey and the Republic of Ireland.

KEY PROJECTS (ARCHEOLOGY)

1986 Identification and analysis of artifacts from the Wallace House National Historic Site, Somerville, New Jersey.

1986 Excavations at the Pluckemin Artillery Cantonment Site, Bedminster Township, New Jersey. Pluckemin Archeological Project/Rutgers University.

1987 Supervised field school students and laboratory analysis, Pluckemin Artillery Cantonment Site, Bedminster Township, New Jersey. Pluckemin Archeological Project/Rutgers University.

1987 Surveyed first United States reservation for Native Americans, Burlington County, New Jersey. Rutgers University.

1988 Designed initial survey and conservation strategies for multiple historic shipwreck sites in southern New Jersey. New Jersey Maritime Heritage Committee.

1988 Survey of an historic Huguenot Church cemetery for reconstruction of burial vaults and reinterment of human remains disturbed during the Civil War, Charleston, South Carolina. The Charleston Museum.

1989 Directed historical research, survey, mapping, testing and analysis of a plantation site and undocumented cemetery, Beaufort County, South Carolina. Yamassee Archeological Project/University of South Carolina.

1989 Supervised field school survey and excavation of Mesolithic-Neolithic village and quarry sites, County Waterford, Ireland. Bally Lough Archeological Project/University of South Carolina.

1990 Performed Phase II testing of prehistoric archeological sites, St. George, South Carolina. Garrow and Associates, Inc.

1991 Directed Phase III Data Recovery at the Philadelphia Gateway Development Parcel (Vine Street Block 32), Philadelphia. Realen Gateway Development Associates, L.P.

1991 Prepared background research for Phase IA Survey of L.E. Carpenter Site, Borough of Wharton, Morris County, New Jersey.

1991 Prepared background research for Phase IA Survey of C & D Recycling Property, Foster Township, Luzerne County, Pennsylvania.

1991 Prepared background research for Phase IA Survey of Radnor Fringe Parking Lot Feasibility Study, Radnor Township, Delaware County, Pennsylvania. Pennsylvania Department of Transportation.

KEY PROJECTS (OSTEOLOGY)

1988 Analyzed bone trace element levels of 31 African-American individuals recovered from an undocumented plantation/postbellum cemetery (ca. 1840-1910) in Mt. Pleasant, South Carolina. University of South Carolina.

1988 Researched and determined stature estimations for remains of 19 African-American Union soldiers interred in 1863, Folly Island, South Carolina. University of South Carolina.

1988 Measured and analyzed dentition of prehistoric human remains from five sites in South Carolina and Georgia for determination of health status and diet. University of South Carolina.

1989 Metrically analyzed skeletons of 31 African-American individuals recovered from an undocumented plantation/postbellum cemetery (ca. 1840-1910) in Mt. Pleasant, South Carolina for indicators of sickle-cell anemia. University of South Carolina.

1990 Researched and prepared demographic reconstruction of skeletal sample recovered from an undocumented plantation/postbellum cemetery (ca. 1840-1910) in Mt. Pleasant, South Carolina. University of South Carolina.

1990 Analyzed fragmentary human remains recovered from the Late Woodland component of the Mayview Wetland Replacement Area Site, Allegheny County, Pennsylvania. The Pennsylvania Department of Transportation.

1990-present Designed, managed, and supervised osteological analysis, 10th Street First African Baptist Church Cemetery Site (ca. 1810-1822), Philadelphia. Gaudet/O'Brian-Urban Engineers, Joint Venture and the Pennsylvania Department of Transportation.

PUBLICATIONS

1989 The Utility of Trace Element Analysis in Determining Subsistence Patterns: An Example from a South Carolina Slave Cemetery. *South Carolina Academy of Sciences Bulletin* 51:55 (Abstract).

1990 The Bone Chemical Analysis and Bioarchaeology of an Historic South Carolina African-American Cemetery. Unpublished Master's thesis, Department of Anthropology, University of South Carolina.

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CULTURAL RESOURCES REPORTS

Author or co-author of over forty (40) environmental impact statements, cultural resources reports, forensic autopsy case reports, and professional papers.

1991 Arms from Addison Plantation and the Maryland Militia on the Potomac Frontier (senior author). *Historical Archaeology* 25(1):66-79.

In Press Militia: The Archaeological Record (co-author). In *The Encyclopedia of the Colonial Wars of America*, edited by Alan Gallay.

CULTURAL RESOURCES REPORTS

Author or co-author of over ninety (90) cultural resources reports and professional papers.

JOHN P. McCARTHY
Principal Archeologist/Project Manager

EDUCATION

B.A.	Temple University	Anthropology/American Studies Magna Cum Laude	1981
M.A.	Temple University	Anthropology	1986
Ph.D. Coursework	Temple University	Anthropology	(ABD 1988)

PROFESSIONAL CERTIFICATION

1990 Society of Professional Archeologists certified in: Field Research, Museology, and Historical Archeology

1991 OSHA-certified 40-hour hazardous waste field training

EXPERIENCE PROFILE

Mr. McCarthy has over fifteen years experience in conducting cultural resources investigations, primarily in the Middle Atlantic region. He was previously a principal in another cultural resources firm, and prior to joining John Milner Associates, Inc., he served as a Senior Environmental Specialist in Archeology for the Office of New Jersey Heritage, Department of Environmental Protection. Mr. McCarthy has also served as a Commissioner on the Delaware County (PA) Heritage Commission. At John Milner Associates, Inc. he has applied his expertise in historical archeology to major archeological excavations of seventeenth through nineteenth century sites in southeastern Pennsylvania, Maryland, Connecticut, and New Jersey. He has also directed numerous archeological surveys and evaluations, and his knowledge of architectural history and historic preservation has been applied to participation in several historic structure reports. In addition, Mr. McCarthy has developed John Milner Associates' program to provide cultural resources services in conjunction with hazardous waste investigation and remediation projects.

KEY PROJECTS

1974-1975 **Archeological survey of prehistoric sites on Cedar Neck, Delaware. Temple University and the Delaware Division of Archeology.**

1978 **Data recovery excavations at the seventeenth century Morton-Mortonson Historic Site, Delaware County, Pennsylvania. Mid-Atlantic Archaeological Research, Inc.**

1979	Archeological excavation at the "Miner's House" and Slave Cemetery, Catoctin Furnace Industrial Site, Thurmont, Maryland. Maryland State Highway Administration.
1980	Conducted data recovery monitoring program at the construction site of the Federal Reserve Bank, Baltimore, Maryland. Mid-Atlantic Archaeological Research, Inc.
1982	Archeological survey of the Task Force Alignment, I-476, Delaware County, Pennsylvania. Cultural Heritage Research Services, Inc.
1984	Supervised Phase II and Phase III archeological excavations at the site of the proposed Society Hill Sheraton, Front and Dock Streets, Philadelphia. Rouse and Associates.
1984-1985 1989	Directed Phase II and Phase III archeological excavations and monitoring of on-going construction in association with the Vine Expressway, Philadelphia, Pennsylvania. Gaudet/O'Brien-Urban Engineers, Michael Baker, Jr., Inc., and the Pennsylvania Department of Transportation.
1986-1987	Historic structure report for Pennsbury Manor, Bucks County, Pennsylvania. Pennsbury Society and the Pennsylvania Historical and Museum Commission.
1986-1988	Directed archeological survey and data recovery investigations at the Addison Plantation Site (18 PR 175); Oxon Hill, Prince George's County, Maryland. James T. Lewis Enterprises, Ltd.
1988-1990	Cataloguing of the artifact collection at Hopewell Furnace National Historic Site, Elverson, Pennsylvania. National Park Service.
1988-1990	Directed data recovery investigations at the Keeler Site, an eighteenth century Quaker farmstead, Rt. 138, Jamestown, Rhode Island. Wilber-Smith Engineers and the Rhode Island Department of Transportation.
1989-	Archeological data recovery excavation of nineteenth century working class residences, Route 19 Connector, Paterson, New Jersey. Hardesty and Hanover and the New Jersey Department of Transportation.
1990-	Archeological, historical, and osteological investigation and analysis of the 1810-22 First African Baptist Church Cemetery at 10th and Vine Streets, Philadelphia, Pennsylvania. Gaudet/O'Brien-Urban Engineers, Joint Venture, Baker Engineers, and the Pennsylvania Department of Transportation.
1990-1991	Phase IA historical and archeological background, Phase IB/II evaluation, and Phase III data recovery investigations of an Irish/immigrant community, Philadelphia Gateway Development parcel, Philadelphia, Pennsylvania. Realen Gateway Development Associates.
1991-	Archeological data recovery at ten sites in the right-of-way of the Iroquois Gas Pipeline, New York and Connecticut. Iroquois Gas Transmission System.

1991 Stage IA and IB archeological investigations at the Lone Pine Landfill Superfund site, Monmouth County, New Jersey. AWD Technologies, Inc.

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1980 Summary Report of Archaeological Investigations: The Federal Reserve Bank Site, Baltimore, Maryland (co-author). *Maryland Historical Trust Occasional Papers*, Vol. 15, Annapolis.

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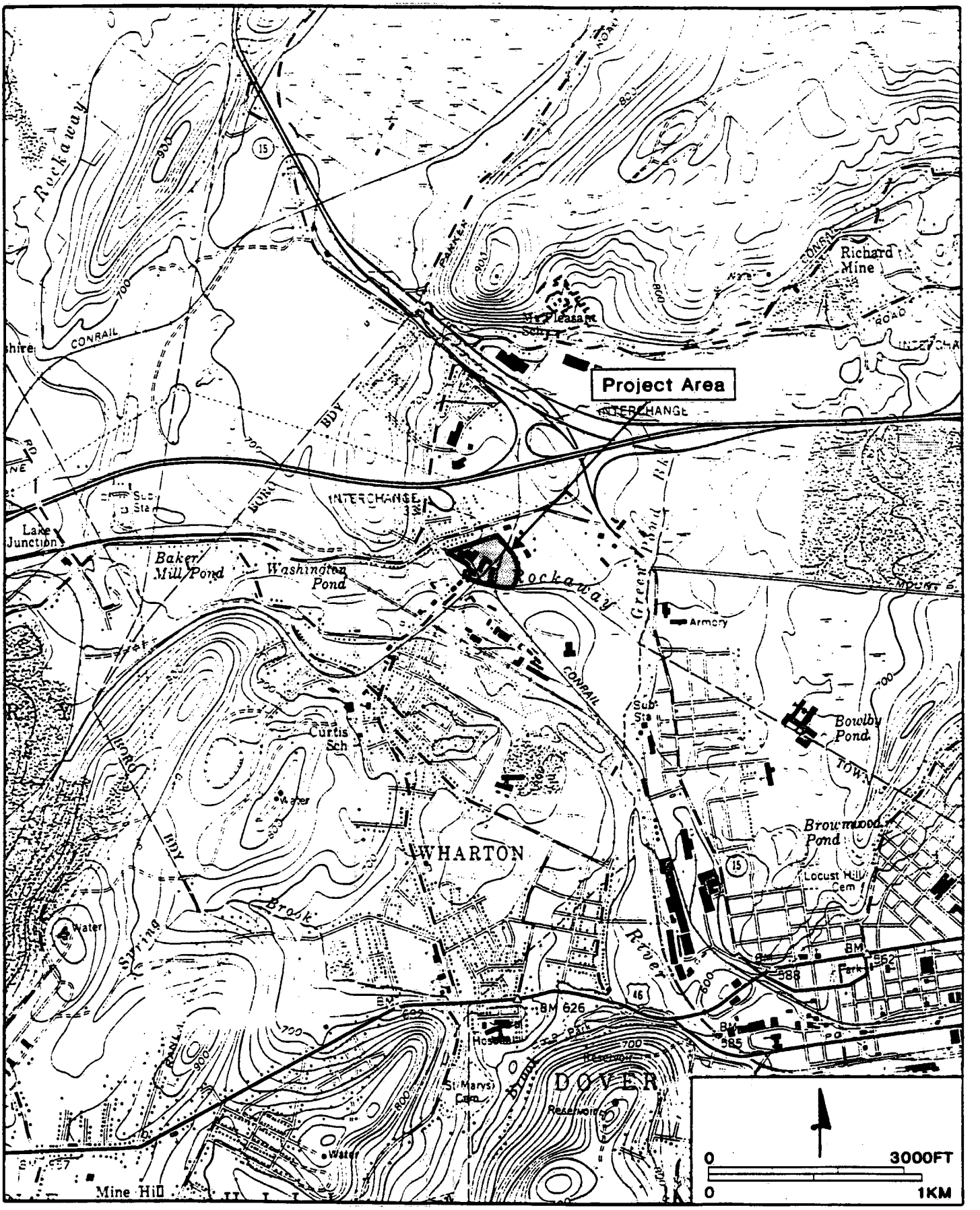
1991 Book Review: *A History of Archaeological Thought*, Bruce G. Trigger, 1989. *American Antiquity* 56(1):161-162.

FIGURES

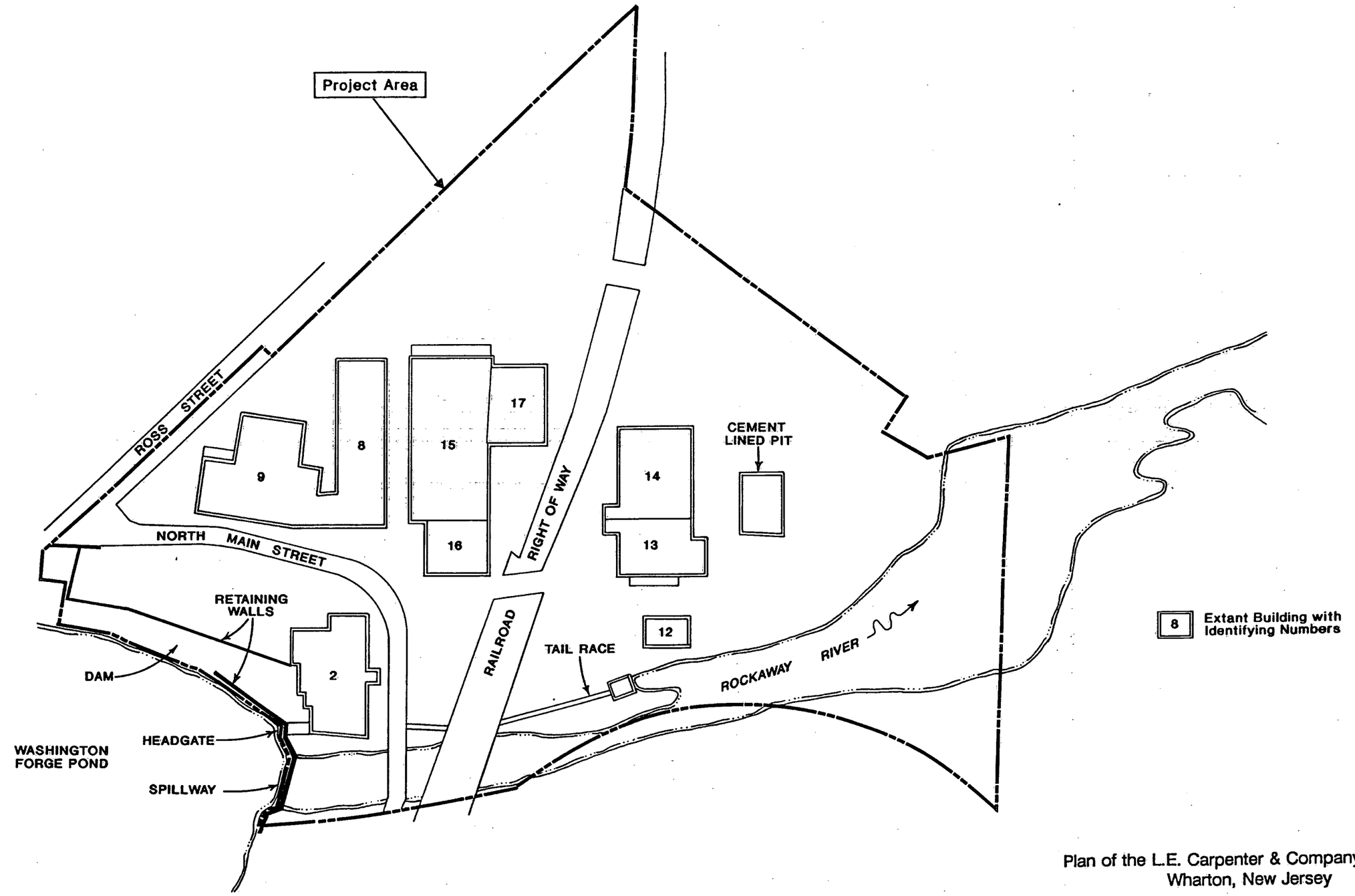


NEW JERSEY

QUADRANGLE LOCATION

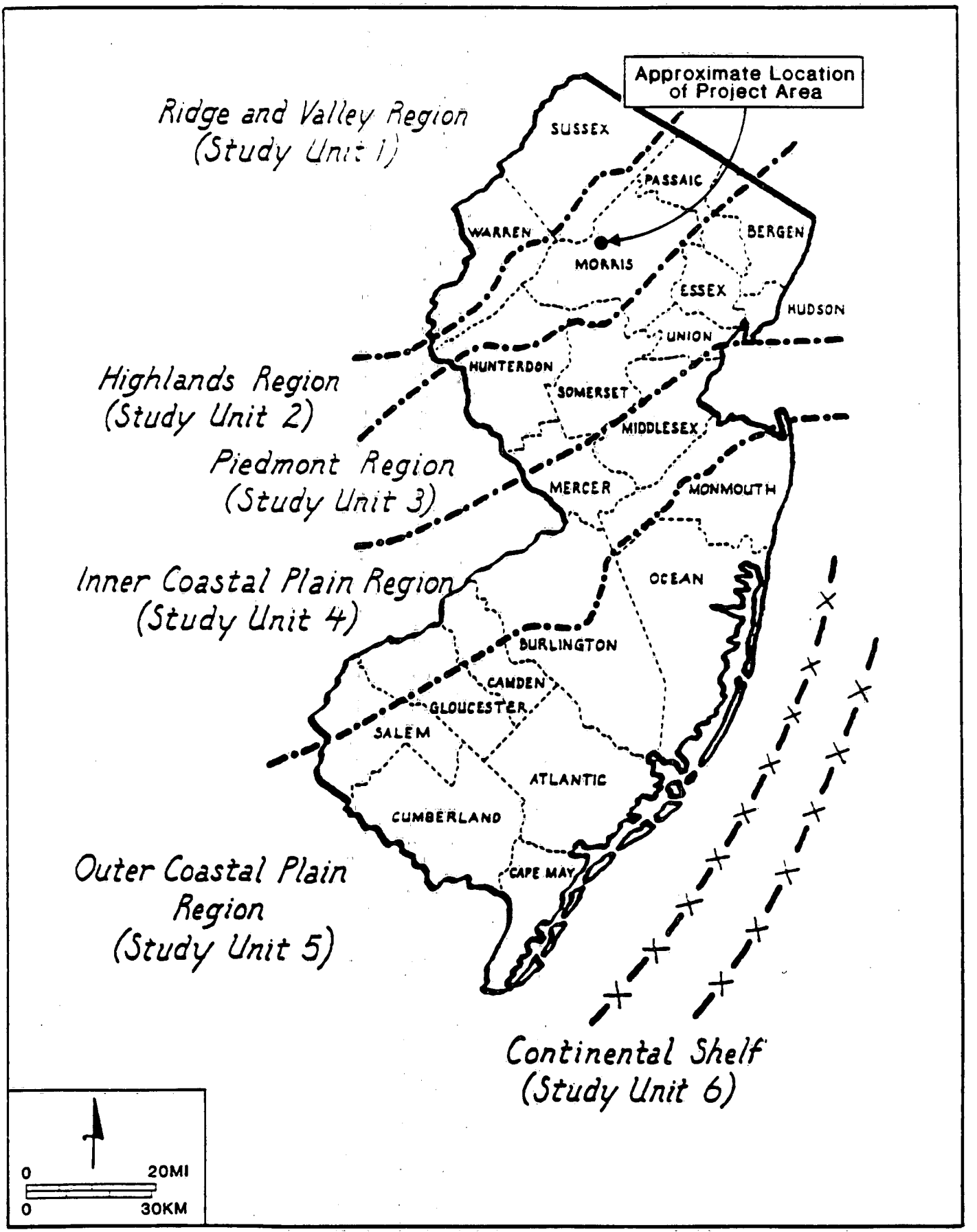
Project Area Location (Detail of *Dover, New Jersey, 7.5 Minute Quadrangle*, USGS, 1954, Photorevised 1981)

Figure 1



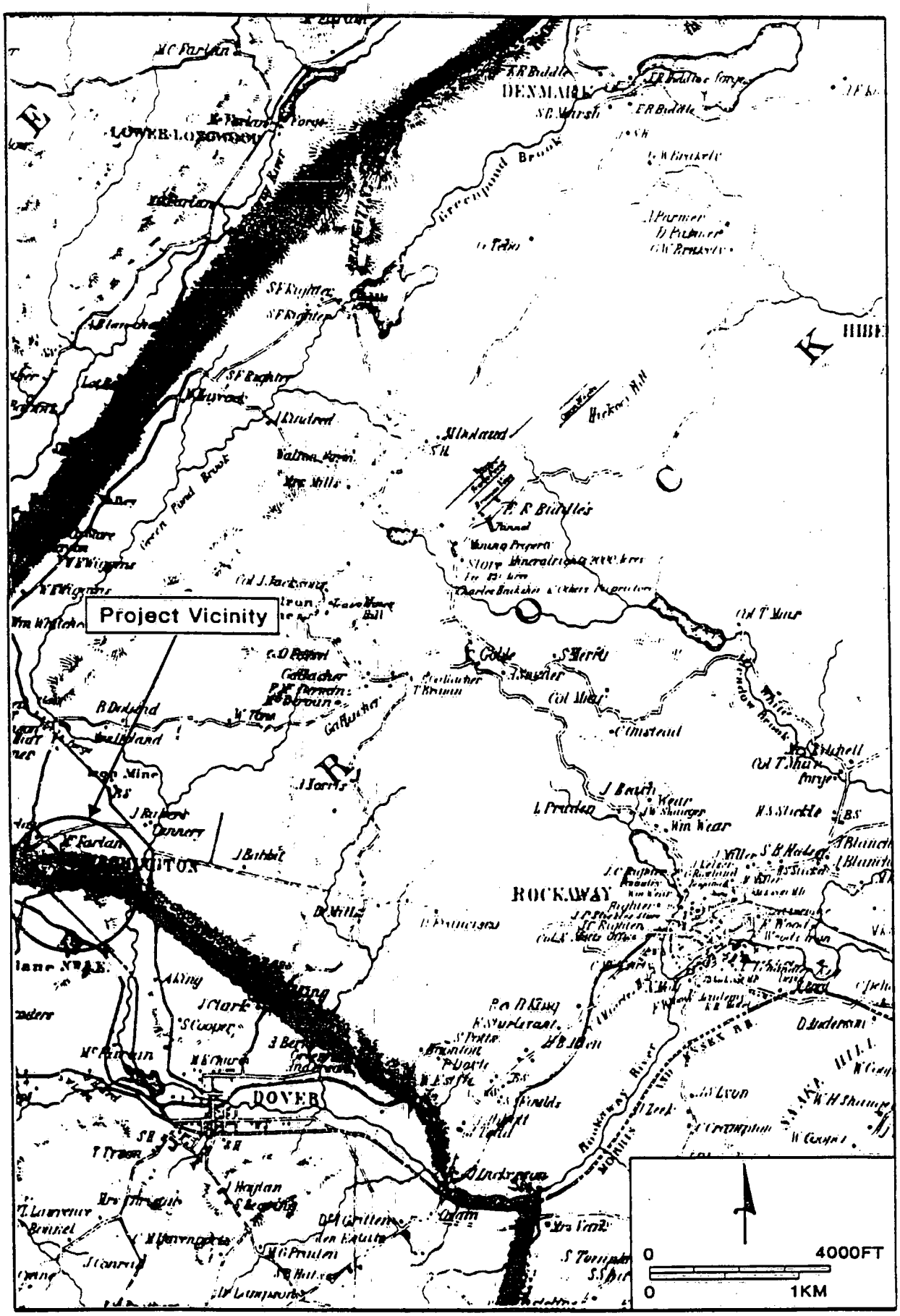
Plan of the L.E. Carpenter & Company Property,
Wharton, New Jersey

Figure 2



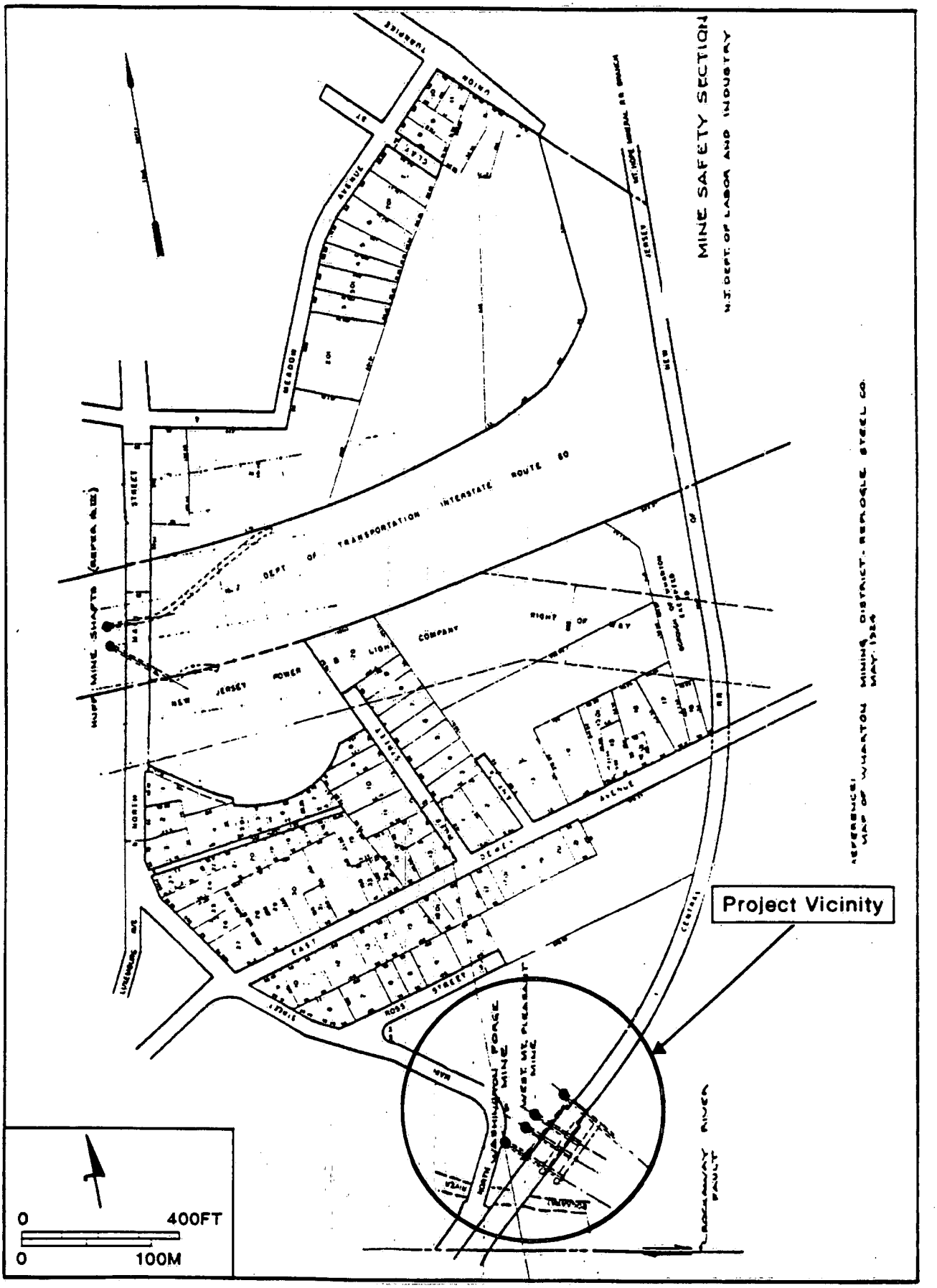
Physiographic Regions of
New Jersey (Marshall 1982)

Figure 3



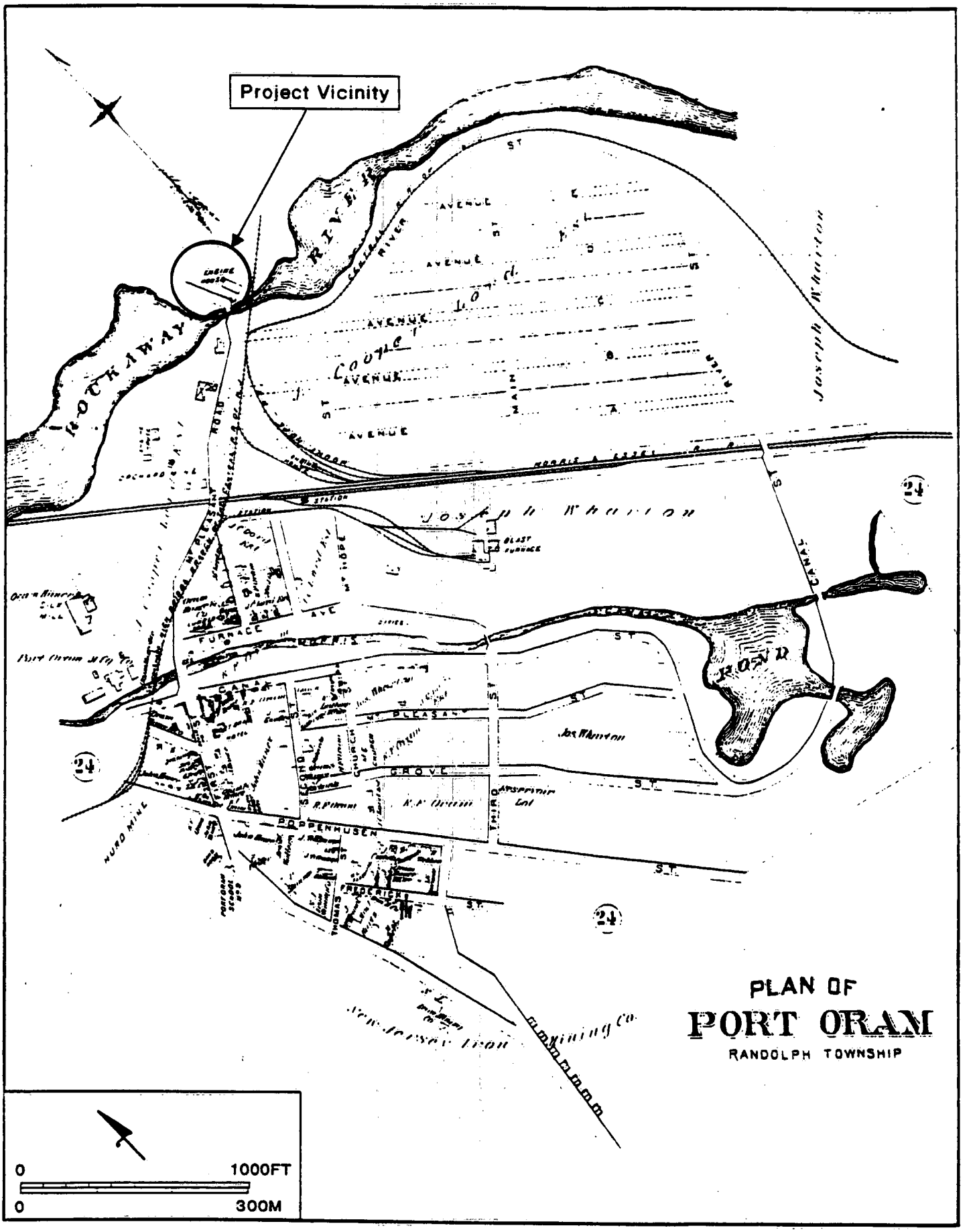
Detail, *Map of Morris County, New Jersey*
(Lightfoot and Geil 1853)

Figure 4



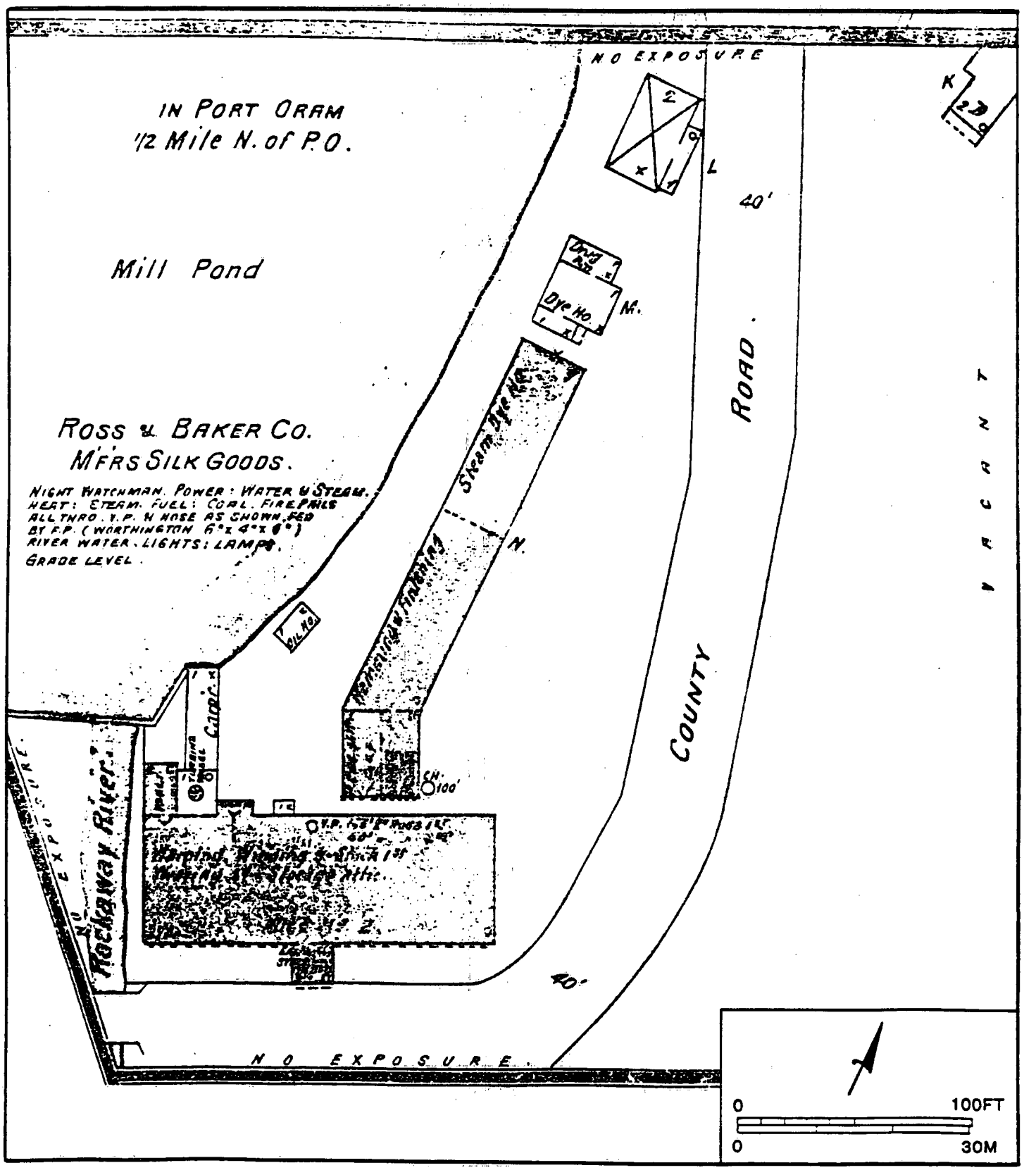
Abandoned Mines in the Project Area
(New Jersey Department of Labor and Industry 1978)

Figure 5



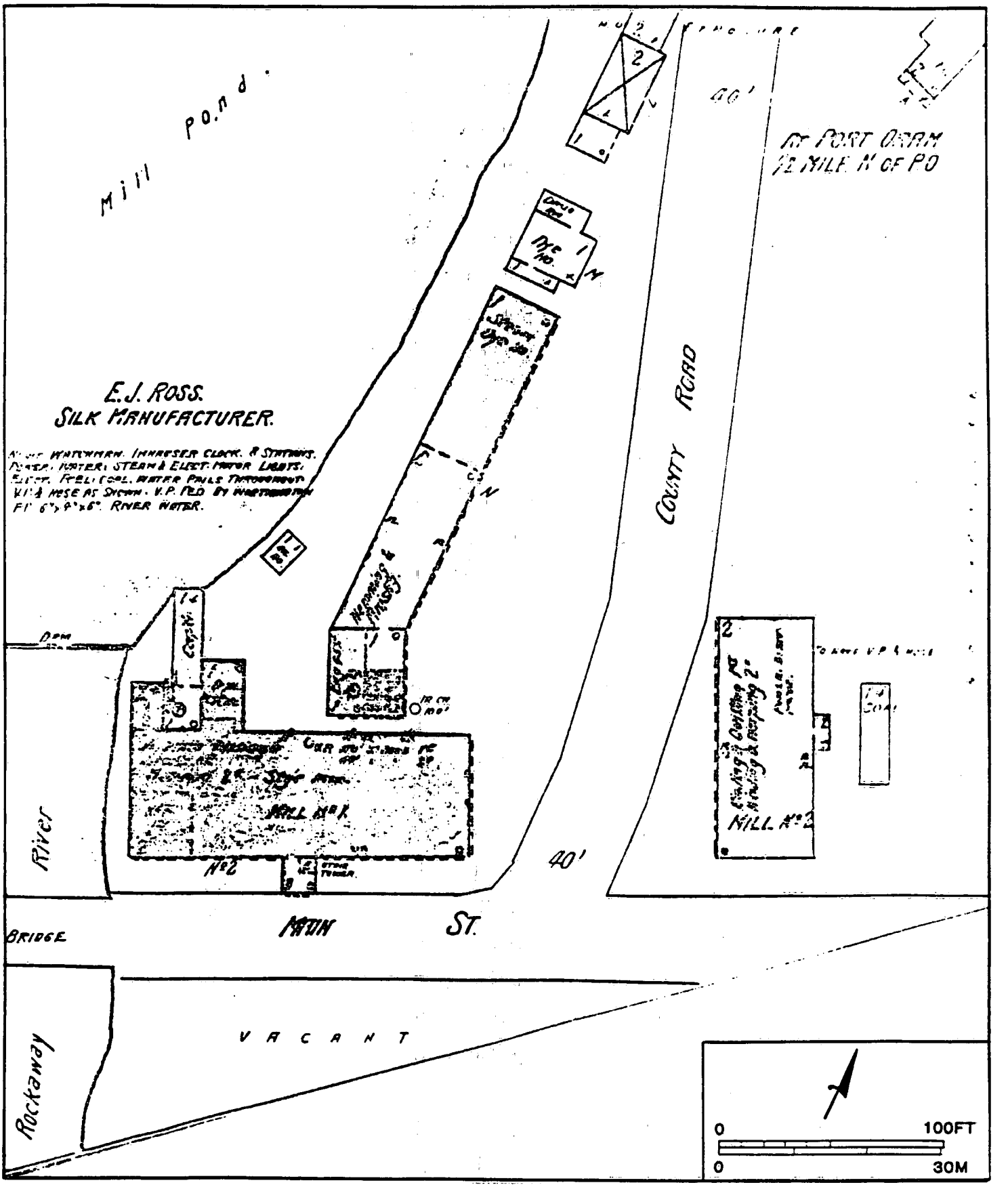
Plan of Port Oram
(Robinson 1887)

Figure 6



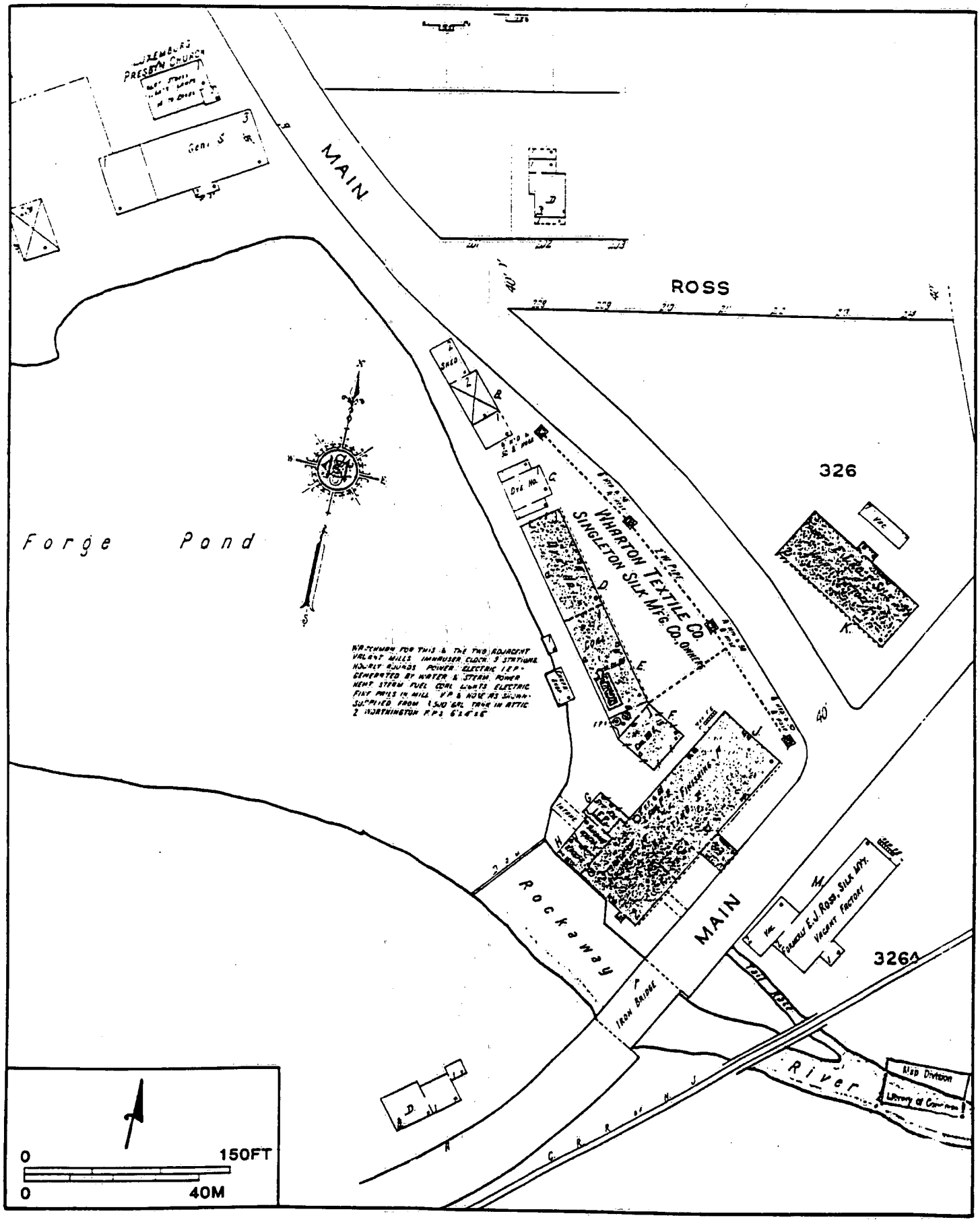
Insurance Map of Ross and Baker Co.
(Sanborn Map Company 1897)

Figure 7



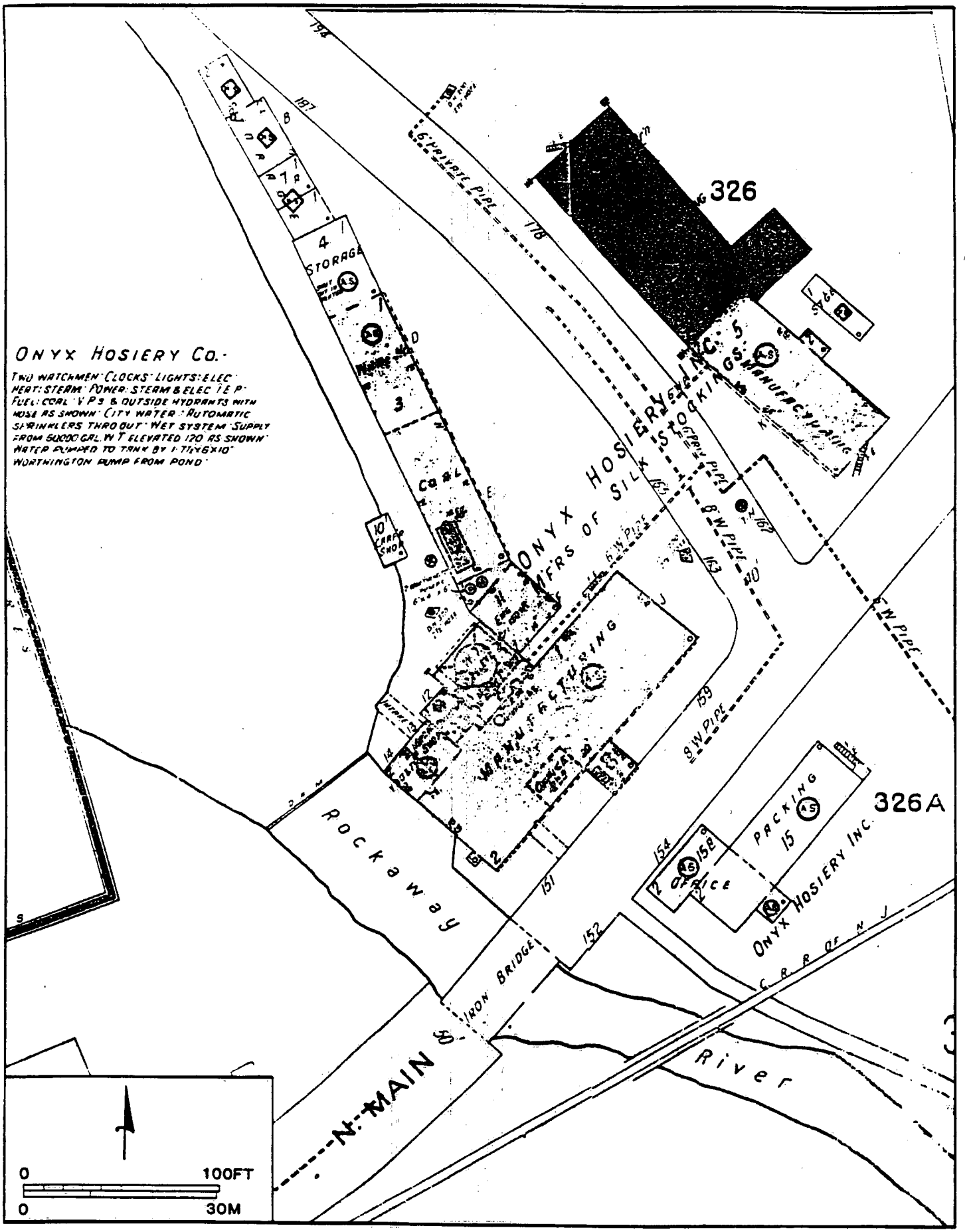
Insurance Map of E. J. Ross, Silk Manufacturer
(Sanborn Map Company 1901)

Figure 8



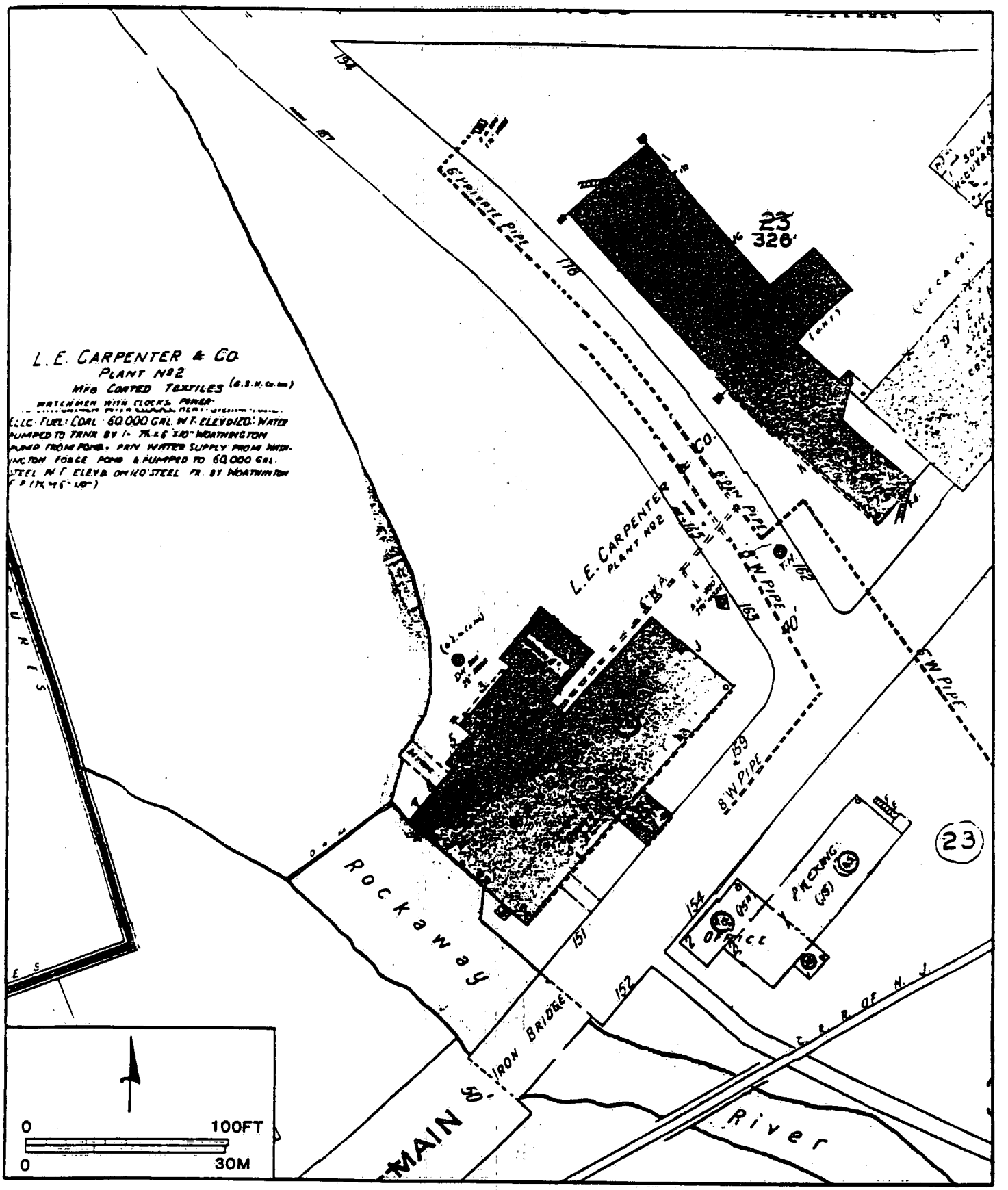
Insurance Map of Wharton Textile Co.
(Sanborn Map Company 1916)

Figure 9



Insurance Map of Onyx Hosiery Inc.
(Sanborn Map Company 1927)

Figure 10



Insurance Map of L. E. Carpenter & Co.
(Sanborn Map Company 1939)

Figure 11

PLATES

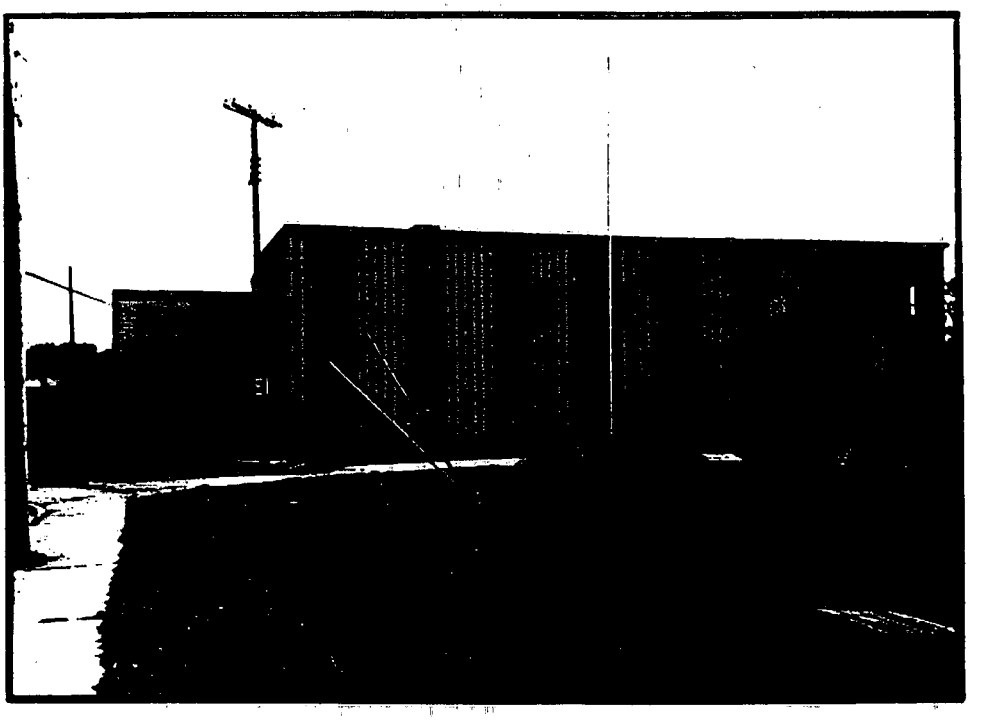


Plate 1. L.E. Carpenter & Company, Building 16, Facing North. Note Lawn Area in the Foreground.

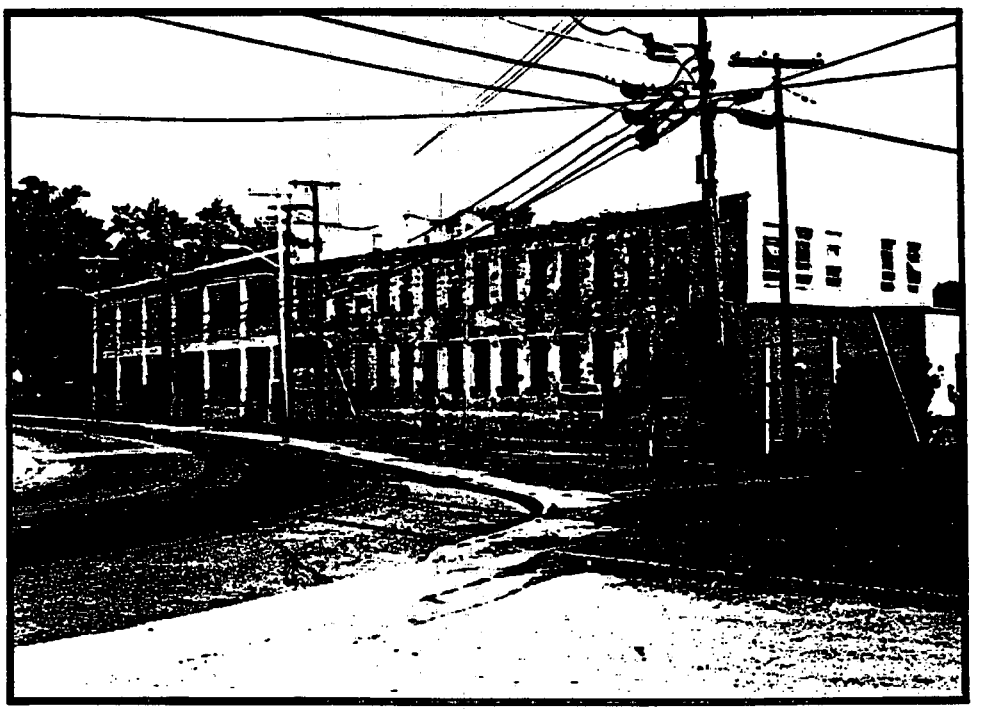


Plate 2. L.E. Carpenter & Company, Building 8-9, Facing Northwest.

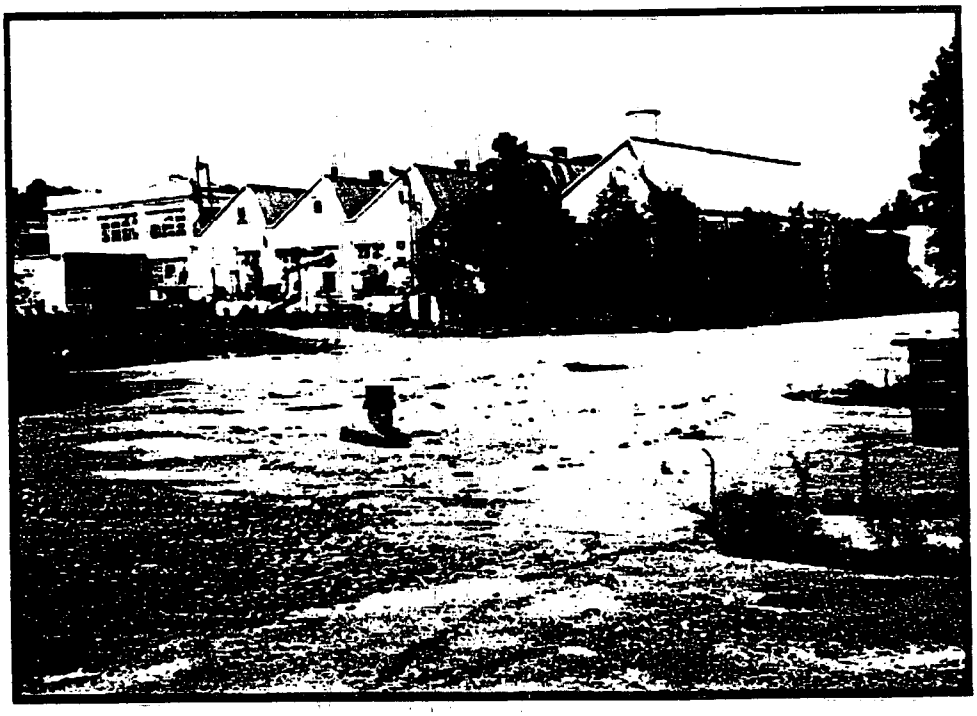


Plate 3. L.E. Carpenter & Company, Building 13-14, Facing Southwest. Note Paved Area in the Foreground.

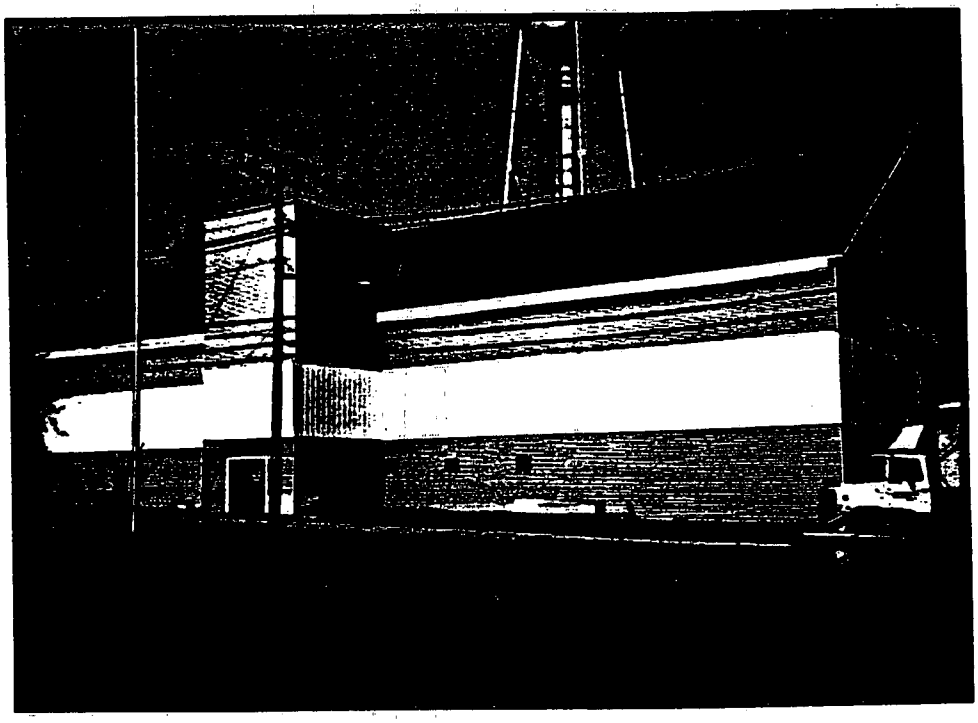


Plate 4. L.E. Carpenter & Company, Building 2 (Former Ross and Baker Silk Mill c. 1889), Facing Southwest.

Plate 5. L.E. Carpenter & Company, Building 2 (Former Ross and Baker Silk Mill c. 1889), Facing East. Note Back Side of Dam to the Right and Partially Paved Area in the Foreground.

Plate 6. Breast of Washington Forge Pond Dam, Facing West-Northwest. Note Washington Forge Pond on the Left.

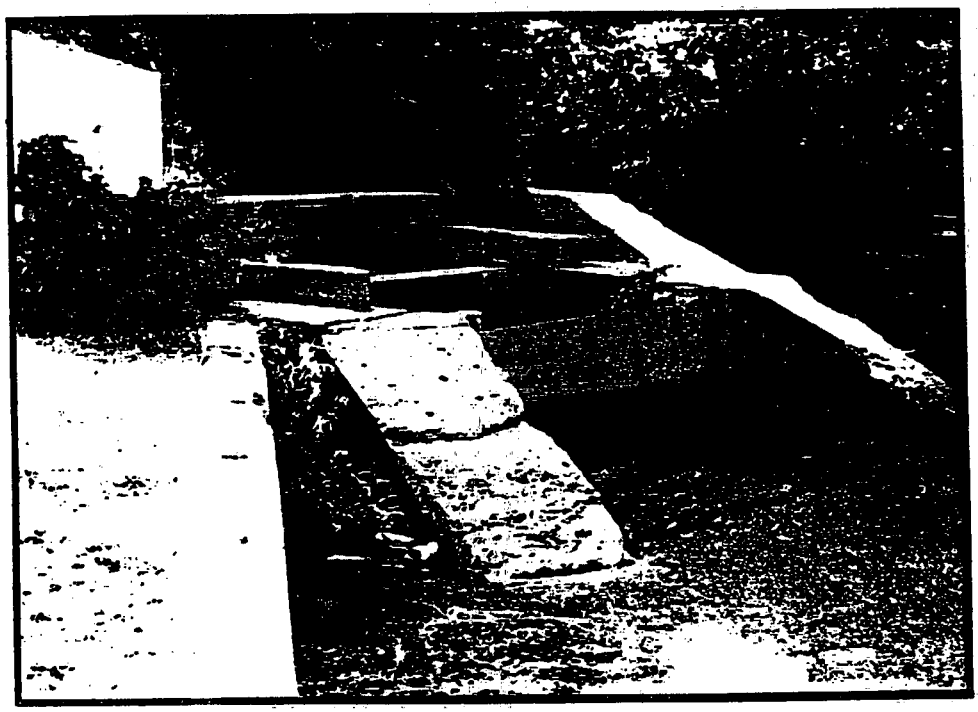


Plate 7. Headgate at Juncture of the Dam and Mill, Facing Southeast.

Plate 8. Cement-lined Pit, Former Location of Chemical Storage Tanks, East of Building 13-14, Facing East.

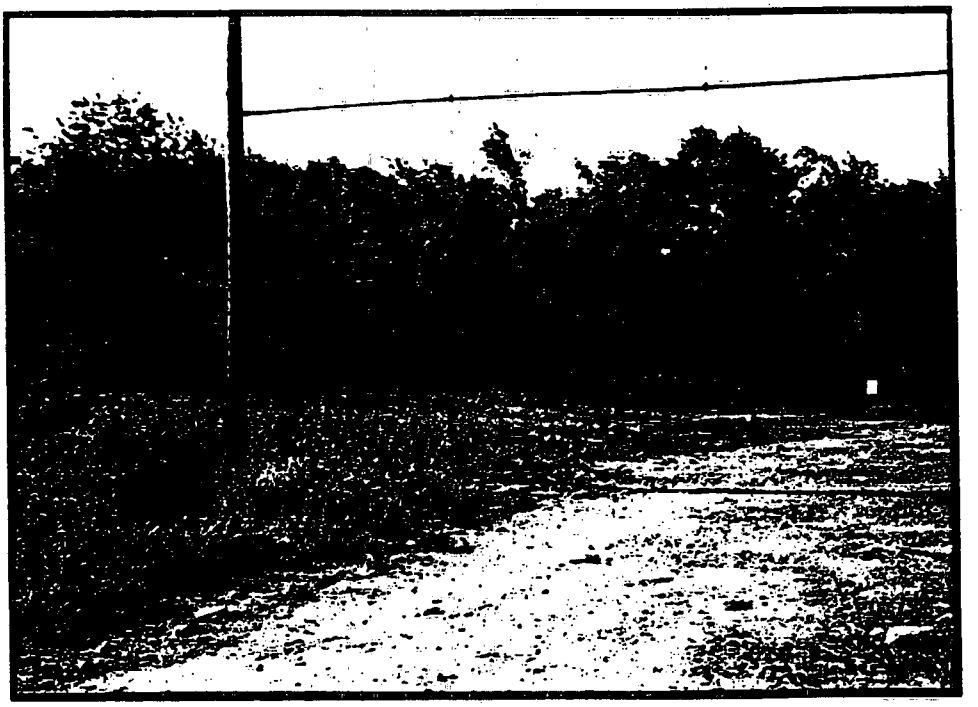


Plate 9. Bare Fill Soil Containing Rubble, Northeast of Building 13-14, Facing Southeast.

Plate 10. Possible Mill Worker Housing, South of Project Area Along North Main Street, Facing Northwest.

Plate 11. Row of Houses North of Ross Street, Facing West.

Plate 12. Castner's General Store, now Sussex Meat Packing Company, North Main Street Adjacent to Ross Street, Facing West.

APPENDIX C

WETLANDS SURVEY

Under Revision

Will Be Submitted Under Separate Cover

TABLE 1
VOLITILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/L)

UG/L	MW-1			MW-2			MW-3			MW-4			MW-5			MW-6	
	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	2	MEAN
	9/21/89	1/25/90		9/21/89	1/24/90		9/22/89	1/24/90		9/21/89	1/24/90		9/21/89	1/24/90		1/25/90	
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5J	1.5J	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	6800	6900	6850	64J	39J	51.5J	10000	6900	8450	1.7J	ND	1.7J	ND	ND	ND	16000	16000
Heptane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	320J	ND	320J	ND	35JB	35JB	ND	1800J	1800J	ND	7.6B	7.6B	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	67J	ND	67J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	32000	36000	34000	1600	1300	1450	67000	31000	49000	17	ND	8.5	ND	ND	ND	120000	120000
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2 Trichloro-1,1,2-triflouroethane	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	9300	9300
Carbon tetrachloride	NA	ND	ND	NA	50J	50J	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND

J - ESTIMATED VALUE

ND - NOT DETECTED

NA - NOT ANALYZED

B - DETECTED IN BLANK

NOTE - ONLY THE ROUNDS SAMPLED ARE SHOWN ON THIS TABLE

MEAN = ARITHMETIC MEAN

TABLE 1
VOLITILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/L)

	MW-7		MW-8			MW-9		MW-10		MW-11i			MW-11d		
	2	MEAN	1	2	MEAN	2	MEAN	2	MEAN	1	2	MEAN	1	2	MEAN
	1/25/90		9/20/89	1/25/90		1/24/90		1/24/90		9/20/89	1/25/90		9/20/89	1/25/90	
Chlorobenzene	ND	ND	ND	ND	ND	1.3J	1.3J	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	2.4J	2.4J	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	3300	3300	ND	34	17	ND	ND	26000	26000	88	ND	44	ND	ND	ND
Heptane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	380J	380J	27	3.3J	15.2J	4.2JB	4.2JB	8800B	8800B	42J	ND	42J	8.7JP	ND	8.7JP
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	15000	15000	13	49	31	ND	ND	120000	120000	700	12	356	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2 Trichloro-1,1,2-triflouroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12	6

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TABLE 1
VOLITILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/L)

	MW-12s			MW-12i			MW-13s				MW-13i				MW-14s		
	1	2	MEAN	1	2	MEAN	1	2	3	MEAN	1	2	3	MEAN	1	2	MEAN
	9/21/89	1/26/90		9/20/89	1/26/90		9/15/89	1/23/90	7/3/91		9/15/89	1/23/90	7/3/91		10/24/89	1/23/90	
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	21	23	18	21	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	3.6J	4.6J	ND	4.1J	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	11	11	14	12	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	640	ND	320	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptane	ND	920J	920J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	140J	ND	140J	8.3J	8B	8.15JB	21JP	ND	ND	21JP	19JP	ND	ND	19JP	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	3.5J	4.2J	ND	3.85J	ND	ND	ND	ND	ND	ND	ND
Toluene	23J	110J	66.5J	ND	ND	ND	1.1J	ND	ND	1.1J	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	2.6J	3.5J	ND	3.05J	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	5.2J	4.4J	ND	4.8J	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	3100	26000	14550	ND	1.2J	1.2J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2 Trichloro-1,1,2-triflouroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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TABLE 1
VOLITILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/L)

	MW-14i			MW-14d			MW-15s			MW-15i			MW-16s			MW-16i		
	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN
	10/24/89	1/23/90		10/24/89	1/23/90		10/24/89	1/23/90		10/24/89	1/23/90		9/20/89	1/22/90		9/20/89	1/22/90	
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	2J	2J	7.5JP	ND	7.5JP	2.8JP	ND	2.8JP	17J	ND	17J	11JP	2J	6.5JP
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	1.9J	ND	1.9J	1.6J	ND	1.6J	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2 Trichloro-1,1,2-triflouroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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TABLE 1
VOLITILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/L)

	MW-17s			MW-17d			MW-18s			MW-18i			MW-18d		
	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN
	9/14/89	1/23/90		9/14/89	1/23/90		9/15/89	1/22/90		9/15/89	1/22/90		9/15/89	1/22/90	
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	8.1JP	ND	8.1JP	2.5J	ND	2.5J	11JP	ND	11JP	12JP	ND	12JP	9JP	ND	9JP
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	2.5J	ND	2.5J	1.3J	ND	1.3J	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2 Trichloro-1,1,2-triflouroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2 Dichloroethane	ND	ND	ND	1.7J	ND	1.7J	ND	ND	ND	ND	ND	ND	ND	ND	ND

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TABLE 1
VOLITILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/L)

	MW-19		MW-20		MW-21		MW-22		MW-23		MW-24		MW-25	
	3	MEAN	3	MEAN	3	MEAN	4	MEAN	4	MEAN	4	MEAN	4	MEAN
	7/3/91		7/3/91		7/3/91		2/19/92		2/19/92		2/19/92		2/19/92	
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30	30	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	2J	2J	35	35	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	ND	ND	3J	3J	36	36	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	3200	3200	ND	ND	ND	ND	ND	ND
Heptane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	160B	160B	8B	8B	56B	56B	7B	7B
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	450	450	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	730	730	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	28	28	ND	ND
Xylenes (total)	ND	ND	10	10	ND	ND	18000	18000	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2 Trichloro-1,1,2-triflouroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MEK	6800								1J					
ACETONE			83											

J - ESTIMATED VALUE

ND - NOT DETECTED

NA - NOT ANALYZED

B - DETECTED IN BLANK

NOTE - ONLY THE ROUNDS SAMPLED ARE SHOWN ON THIS TABLE

MEAN = ARITHMETIC MEAN

TABLE 2
SEMIVOLATILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, and 4 (ug/l)

	MW-1			MW-2			MW-3			MW-4			MW-5			MW-6		MW-7	
	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	2	MEAN	2	MEAN
	9/21/89	1/25/90		9/21/89	1/24/90		9/22/89	1/24/90		9/22/89	1/24/90		9/22/89	1/24/90		1/25/90		1/25/90	
bis (2-Ethylhexyl)phthalate	55J	22	38.5J	ND	7.0J	7.0J	ND	38000	19000	ND	3.6J	3.6J	ND	17	8.5	62000D	62000D	4100D	4100D
Butyl benzyl phthalate	ND	ND	ND	ND	ND	ND	480J	110	295J	ND	ND	ND	ND	ND	ND	160	160	ND	ND
n-Butylbenzene	ND	6.0JD	6JD	ND	ND	ND	ND	24	12	ND	ND	ND	ND	ND	ND	ND	ND	6.8J	6.8J
n-Decane	ND	6.3JD	6.3JD	ND	ND	ND	4200	1000	1650	ND	ND	ND	ND	ND	ND	3100D	3100D	47	47
1,2-Diethylbenzene	ND	15JD	15JD	ND	8.8J	8.8J	ND	21	10.5	ND	ND	ND	ND	ND	ND	100D	100D	28	28
Diethylphthalate	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND	ND	110	55	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	870	200	535	ND	ND	ND	ND	ND	ND	120	120	32	32
1-Ethyl-3-methylbenzene	ND	260D	260D	ND	21	10.5	400J	140	270J	ND	ND	ND	ND	ND	ND	420D	420D	110	110
Isopropyl benzene	17J	32D	24.5JD	ND	41	20.5	ND	84	42	ND	ND	ND	ND	ND	ND	100D	100D	48	48
Naphthalene	ND	ND	ND	ND	ND	ND	ND	2.7J	2.7J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA
n-Nonane	ND	ND	ND	ND	ND	ND	1100	310	705	ND	ND	ND	ND	ND	ND	520D	520D	33	33
1,2,3,4-Tetramethylbenzene	ND	ND	ND	ND	ND	ND	ND	7.2J	7.2J	ND	ND	ND	ND	ND	ND	ND	ND	4.4J	4.4J
1,2,3,5-Tetramethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trimethylbenzene	ND	210LD	210LD	ND	38L	38L	ND	210L	210L	ND	ND	ND	ND	ND	ND	320LD	320LD	110L	110L
1,2,4-Trimethylbenzene	67	210LD	139LD	ND	38L	38L	670	210L	440L	ND	ND	ND	ND	ND	ND	320LD	320LD	110L	110L
1,3,5-Trimethylbenzene	130	430D	280D	ND	ND	ND	ND	280	140	ND	ND	ND	ND	ND	ND	490D	490D	110	110
2,4-Dimethylphenol	230	38I	134I	ND	2.8J	2.8J	ND	15	7.5	ND	ND	ND	ND	ND	ND	180	180	4.1J	4.1J
Phenol	ND	130I	130I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	68	68	ND	ND
2-Nitrophenol	ND	8.8JI	8.8JI	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NA - NOT ANALYZED

ND - NOT DETECTED

J - ESTIMATED VALUE

D - SECONDARY DILUTION

L - NOT SEPERABLE/QUANTIFIED TOGETHER

I - MATRIX INTERFERENCE

MEAN = ARITHMETIC MEAN

TABLE 2 – CONTINUED
SEMIVOLATILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, and 4 (ug/l)

	MW-8			MW-9		MW-10		MW-11d			MW-11i			MW-12i			MW-12s			MW-13i			
	1	2	MEAN	2	MEAN	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	3	MEAN
	9/20/89	1/25/90		1/24/90		1/24/90		9/20/89	1/25/90		9/20/89	1/25/90		9/21/89	1/26/90		9/21/89	1/26/90		9/15/89	1/23/90	7/3/91	
bis (2-Ethylhexyl)phthalate	1100	540	820	48	48	34000D	34000D	ND	3600D	3600D	ND	ND	ND	ND	77	37.5	320	5300	2810	ND	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND	ND	ND	350D	350D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	27	27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Decane	ND	16J	16J	ND	ND	2400	2400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.9J	6.9J	ND	ND	ND	ND
1,2-Diethylbenzene	ND	ND	ND	ND	ND	13	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	ND	NA	ND	NA	NA	ND	ND	ND	2.2	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND	12	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200	100	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	89	89	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	61	30.5	ND	ND	ND	ND
1-Ethyl-3-methylbenzene	ND	10J	10J	ND	ND	180	180	ND	ND	ND	ND	ND	ND	ND	ND	ND	18	2.3J	10.2J	ND	ND	ND	ND
Isopropyl benzene	ND	11J	11J	ND	ND	80	80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.2J	3.5J	2.85J	ND	ND	ND	ND
N-Nitrosodiphenylamine	ND	NA	ND	NA	NA	ND	ND	ND	22	11	ND	ND	ND	ND	ND	ND	13	ND	6.5	ND	ND	ND	ND
n-Nonane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-Tetramethylbenzene	ND	ND	ND	ND	ND	10	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	230	115	ND	ND	ND	ND
1,2,3,5-Tetramethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trimethylbenzene	ND	ND	ND	ND	ND	240L	240L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	290	145	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	240L	240L	ND	ND	ND	ND	5.2J	5.2J	ND	ND	ND	14	49q	32q	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	6.3J	6.3J	ND	ND	490	490	ND	ND	ND	ND	ND	ND	ND	ND	ND	19	12q	15.5q	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	86	86	ND	ND	ND	76	ND	38	ND	ND	ND	32	ND	16	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND	120	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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TABLE 2 – CONTINUED
SEMIVOLATILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, and 4 (ug/l)

	MW-13s				MW-14d			MW-14i			MW-14s			MW-15i		MW-15s			MW-16i			MW-16s		
	1	2	3	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN
	9/15/89	1/23/90	7/3/91		10/24/89	1/23/90		10/24/89	1/23/90		10/24/89	1/23/90		9/14/89		9/14/89	1/23/90		9/20/89	1/22/90		9/20/89	1/22/90	
bis (2-Ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	120	790	455	ND	ND	ND	ND	ND	ND	2.4J	2.4J	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Decane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Diethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.8J	2.8J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-Ethyl-3-methylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropyl benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Nonane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-Tetramethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,5-Tetramethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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TABLE 2 – CONTINUED
SEMIVOLATILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, and 4 (ug/l)

	MW-17D			MW-17s			MW-18d			MW-18i			MW-18s			MW-19	MW-20	MW-21	
	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	1	2	MEAN	MEAN	MEAN	3	MEAN
	9/14/89	1/23/90		9/14/89	1/23/90		9/15/89	1/22/90		9/15/89	1/22/90		9/15/89	1/22/90				7/3/91	
bis (2-Ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Butyl benzyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
n-Decane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,2-Diethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
1-Ethyl-3-methylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Isopropyl benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
n-Nonane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,2,3,4-Tetramethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,2,3,5-Tetramethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,2,3-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND

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TABLE 2 – CONTINUED
SEMIVOLATILE ORGANICS RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, and 4 (ug/l)

	MW-22		MW-23			MW-24			MW-25	
	MEAN		4	MEAN		4	MEAN		4	MEAN
			2/19/92			2/19/92			2/19/92	
bis (2-Ethylhexyl)phthalate	NA		10JB	10JB		5JB	5JB		8JB	8JB
Butyl benzyl phthalate	NA		ND	ND		ND	ND		ND	ND
n-Butylbenzene	NA		ND	ND		ND	ND		ND	ND
n-Decane	NA		ND	ND		ND	ND		ND	ND
1,2-Diethylbenzene	NA		ND	ND		ND	ND		ND	ND
Diethylphthalate	NA		ND	ND		ND	ND		ND	ND
Di-n-butyl phthalate	NA		2JB	2JB		2JB	2JB		2JB	2JB
Di-n-octyl phthalate	NA		ND	ND		ND	ND		ND	ND
1-Ethyl-3-methylbenzene	NA		ND	ND		ND	ND		ND	ND
Isopropyl benzene	NA		ND	ND		ND	ND		ND	ND
Naphthalene	NA		ND	ND		ND	ND		ND	ND
N-Nitrosodiphenylamine	NA		ND	ND		ND	ND		ND	ND
n-Nonane	NA		ND	ND		ND	ND		ND	ND
1,2,3,4-Tetramethylbenzene	NA		ND	ND		ND	ND		ND	ND
1,2,3,5-Tetramethylbenzene	NA		ND	ND		ND	ND		ND	ND
1,2,3-Trimethylbenzene	NA		ND	ND		ND	ND		ND	ND
1,2,4-Trimethylbenzene	NA		ND	ND		ND	ND		ND	ND
1,3,5-Trimethylbenzene	NA		ND	ND		ND	ND		ND	ND
2,4-Dimethylphenol	NA		ND	ND		ND	ND		ND	ND
Phenol	NA		ND	ND		ND	ND		ND	ND
2-Nitrophenol	NA		ND	ND		ND	ND		ND	ND

NA – NOT ANALYZED

ND – NOT DETECTED

J – ESTIMATED VALUE

D – SECONDARY DILUTION

L – NOT SEPERABLE/QUANTIFIED TOGETHER

I – MATRIX INTERFERENCE

MEAN = ARITHMETIC MEAN

TABLE 3
INORGANIC RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/l)

	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6	MW-7
	1	2	1	2	1	2	1	2	1	2	2	2
PARAMETER												
ug/l	9/21/89	1/25/90	9/21/89	1/24/90	9/22/89	1/24/90	9/21/89	1/24/90	9/21/89	1/24/90	1/25/90	1/25/90
ANTIMONY	ND	ND	ND	ND	ND	ND	ND	32.3J	ND	ND	54.9J	ND
ARSENIC	ND	ND	ND	ND	21	7.2J	ND	3.1J	ND	ND	3.3J	31.7
BERYLLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CADMIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHROMIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COPPER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	26.1
LEAD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.3S
MERCURY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NICKEL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SELENIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SILVER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THALLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZINC	910	ND	80	60.1	20	ND	20	289	160	ND	56.4	224
CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOLICS	440	ND	ND	ND	40	310	ND	ND	ND	ND	620	15

J – ESTIMATED VALUE

ND – NOT DETECTED

NOTE:ONLY THE ROUNDS SAMPLED FOR ARE SHOWN ON THIS TABLE

TABLE 3
INORGANIC RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/l)

	MW-8			MW-9		MW-10		MW-11d			MW-11i			MW-12i			MW-12s	
	1	2		2		2		1	2		1	2		1	2		1	2
PARAMETER																		
	9/20/89	1/25/90		1/24/90		1/24/90		9/20/89	1/25/90		9/20/89	1/25/90		9/20/89	1/26/90		9/21/89	1/26/90
ANTIMONY	ND	ND		ND		35.5J		ND	ND		ND	ND		ND	ND		540	75
ARSENIC	5	8.1		ND		21.3		ND	ND		ND	ND		ND	ND		8	8.8J
BERYLLIUM	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
CADMIUM	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
CHROMIUM	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
COPPER	ND	ND		ND		ND		ND	ND		ND	ND		ND	9J		ND	ND
LEAD	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
MERCURY	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
NICKEL	ND	ND		ND		ND		ND	ND		40	19.1J		ND	ND		90	ND
SELENIUM	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		15	ND
SILVER	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
THALLIUM	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
ZINC	410	43.4		ND		46.3		100	ND		20	12.9J		190	ND		150	15.8J
CYANIDE	ND	ND		ND		ND		ND	ND		ND	ND		ND	ND		ND	ND
PHENOLICS	ND	ND		ND		350		ND	ND		50	ND		ND	ND		30	70

J – ESTIMATED VALUE

ND – NOT DETECTED

NOTE:ONLY THE ROUNDS SAMPLED FOR ARE SHOWN ON THIS TABLE

TABLE 3
INORGANIC RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/l)

PARAMETER	MW-13i			MW-13s			MW-14d		MW-14i		MW-14s		MW-15i		MW-15s	
	1	2	3	1	2	3	1	2	1	2	1	2	1	2	1	2
	9/15/89	1/23/90	7/3/91	9/15/89	1/23/90	7/3/91	10/24/89	1/23/90	10/24/89	1/23/90	10/24/89	1/23/90	9/14/89	1/23/90	9/14/89	1/23/90
ANTIMONY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ARSENIC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BERYLLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CADMIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHROMIUM	20	94.5	ND	ND	ND	40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COPPER	ND	7.4J	ND	170	66.7	ND	20	ND	20	10.2J	ND	ND	ND	ND	ND	ND
LEAD	ND	ND	ND	ND	ND	ND	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
MERCURY	ND	ND	ND	ND	ND	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NICKEL	ND	ND	ND	140	77.1	70	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SELENIUM	ND	2.3J	ND	ND	2.0J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SILVER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THALLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZINC	10	ND	ND	60	36.4	20	80	ND	380	13.6J	30	ND	40	ND	50	ND
CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOLICS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

J – ESTIMATED VALUE

ND – NOT DETECTED

NOTE:ONLY THE ROUNDS SAMPLED FOR ARE SHOWN ON THIS TABLE

TABLE 3
INORGANIC RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/l)

PARAMETER	MW-16s		MW-16i		MW-17D		MW-17S		MW-18d		MW-18i		MW-18s	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
	9/20/89	1/22/90	9/20/89	1/22/90	9/14/89	1/23/90	9/14/89	1/23/90	9/15/89	1/22/90	9/15/89	1/22/90	9/15/89	1/22/90
ANTIMONY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ARSENIC	7	ND	ND	6.7J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BERYLLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CADMIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHROMIUM	ND	ND	ND	ND	10	15.4	ND	ND	ND	ND	ND	ND	ND	ND
COPPER	ND	8.1J	ND	7.3J	ND	5.3J	ND	ND	10	7.3J	ND	8.6J	ND	7.3J
LEAD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MERCURY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NICKEL	ND	ND	ND	81.3	ND	ND	ND	ND	ND	ND	790	1250	40	ND
SELENIUM	ND	ND	ND	2.5J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SILVER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THALLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZINC	10	15.6J	50	42.6	20	ND	20	ND	350	13.5J	440	17.3J	120	13.3J
CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOLICS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	18	ND	ND

J – ESTIMATED VALUE

ND – NOT DETECTED

NOTE:ONLY THE ROUNDS SAMPLED FOR ARE SHOWN ON THIS TABLE

TABLE 3
INORGANIC RESULTS
GROUNDWATER SAMPLING
ROUNDS 1,2,3, AND 4 (ug/l)

PARAMETER	MW-21		MW-22		MW-23		MW-24		MW-25	
	3		4		4		4		4	
	7/3/91		2/19/92		2/19/92		2/19/92		2/19/92	
ANTIMONY	ND		ND		ND		ND		ND	
ARSENIC	ND		20.2		ND		ND		ND	
BERYLLIUM	ND		ND		23.9		7.4		6.7	
CADMIUM	ND		ND		7.9		ND		ND	
CHROMIUM	ND		30.1		518		137		167	
COPPER	ND		75.4		1700		244		452	
LEAD	ND		18.6		672		91		98	
MERCURY	ND		ND		2		0.25		0.47	
NICKEL	ND		ND		496		132		203	
SELENIUM	ND		ND		ND		ND		ND	
SILVER	ND		ND		32.1		ND		12.4	
THALLIUM	ND		ND		ND		ND		ND	
ZINC	ND		105		1920		385		650	
CYANIDE	ND		NA		NA		NA		ND	
PHENOLICS	ND		NA		NA		NA		ND	

J – ESTIMATED VALUE

ND – NOT DETECTED

NOTE:ONLY THE ROUNDS SAMPLED FOR ARE SHOWN ON THIS TABLE

1. THE CONTRACTOR WILL BE REQUIRED TO COORDINATE TRAFFIC CONTROLS WITH THE WHARTON CHIEF OF POLICE.

2. UPON COMPLETION OF THE WORK, ALL FENCING REMOVED DURING CONSTRUCTION SHALL BE RESTORED TO LIKE UNDER ITEM 19. ON GRAVEL SURFACE OF PROPERTIES SHALL BE PROVIDED DURING NON-WORKING HOURS TO THE USE OF ALL WATER AND/OR TEMPORARY FENCES.

3. TREES ALONG THE SOUTH SIDE OF ROSS STREET SHALL BE PROTECTED DURING CONSTRUCTION.

4. TEST PITS WILL BE REQUIRED IN THE VICINITY OF MH W-11 AND W-13 TO DETERMINE GROUNDWATER CONTAMINATION EXISTS. GROUNDWATER SAMPLES SHALL BE TAKEN AND ANALYZED BY THE ENGINEER. IF CONTAMINATION DOES EXIST, WATER REMOVED FROM TRENCHES OR EXCAVATING FACILITIES SHALL BE DISPOSED OF IN THE EXISTING SANITARY SEWER WITH PAYMENT UNDER ITEM 1.

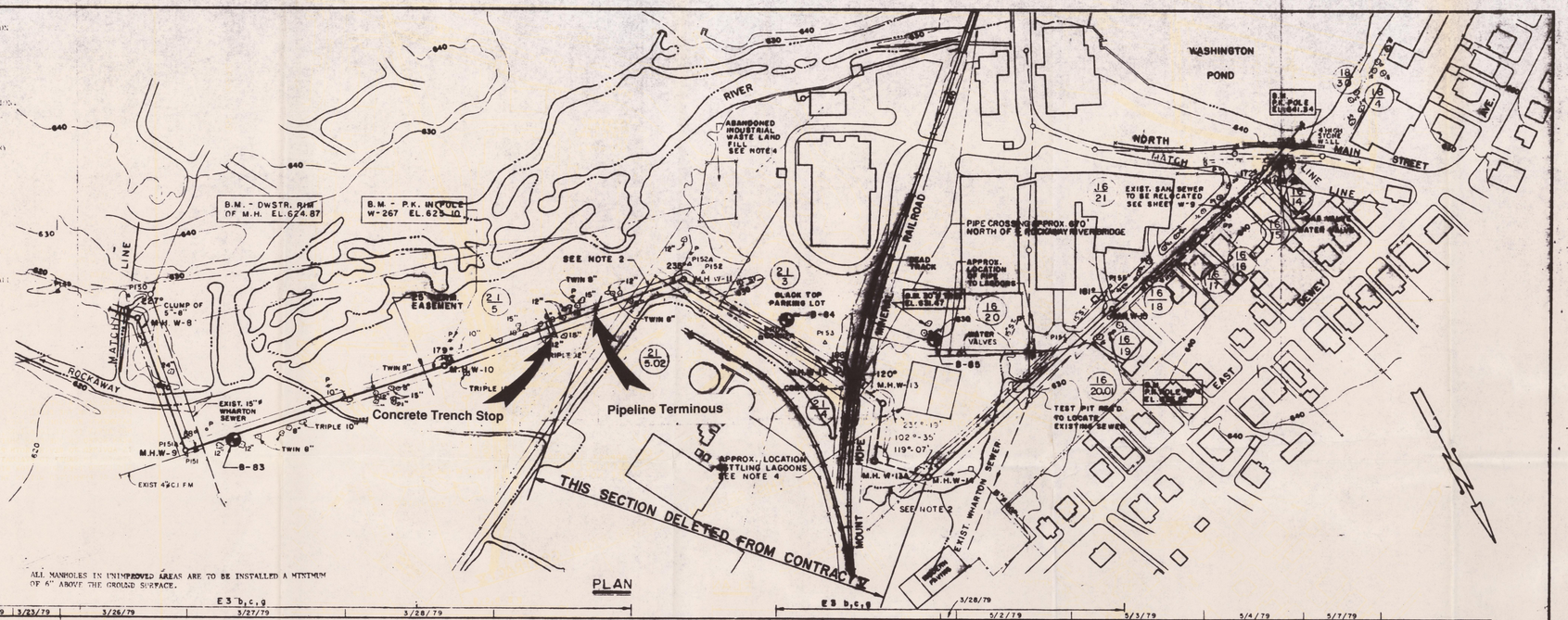
5. PERMANENT PAVEMENT REPLACEMENT ON ROSS STREET SHALL CONSIST OF A FULL WIDTH SURFACE COURSE WITH PATCHES MADE FOR THE ACTUAL QUANTITY OF PAVEMENT REMOVED AS DIRECTED BY THE ENGINEER. TEMPORARY PAVEMENT SHALL BE PROVIDED AS SPECIFIED AND FOR ITEM 19 SEPARATELY.

6. ACCESS SHALL BE PROVIDED FOR EMERGENCY VEHICLES TO RESIDENCES ALONG ROSS STREET. ACCESS TO ALL DRIVEWAYS SHALL BE PROVIDED DURING NON-WORKING HOURS.

7. THE CONTRACTOR SHALL MAINTAIN CONTINUOUS TRUCK ACCESS TO AND FROM THE ROSS STREET ENTRANCE TO THE L.V. CARPENTER BUILDING (ROUTE 46 LOT 20).

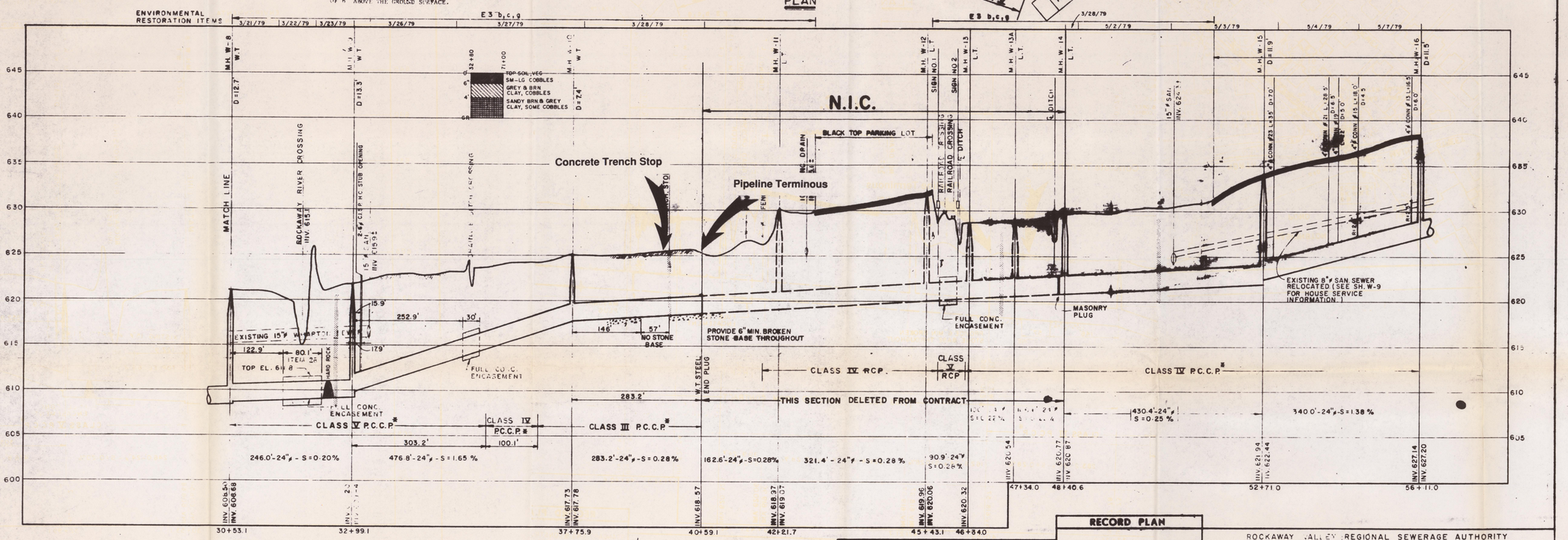
8. THE OPEN CUT RAILROAD CROSSING SHOWN SHALL BE CONSTRUCTED IN ACCORDANCE WITH ALL CONRAIL REQUIREMENTS. THE CONTRACTOR SHALL SCHEDULE THIS WORK AS PERMITTED BY CONRAIL. PAYMENT UNDER ITEM 22.

IN GENERAL, RIGHTS-OF-WAY CONSIST OF A 25 FOOT WIDE PERMANENT WIDTH CENTERED ON THE PIPELINE(S), WITH 25 FOOT TEMPORARY CONSTRUCTION EASEMENTS PROVIDED ON EACH SIDE. THIS CONFIGURATION, HOWEVER, DOES NOT APPLY IN ALL LOCATIONS, AND WHERE DEVIATIONS EXIST, THEY HAVE BEEN NOTED ON THE PLAN SHEETS OR DETAIL BLOW-UP SHEETS. CONTRACTOR IS ADVISED TO REVIEW BOTH PLAN AND DETAIL SHEETS CAREFULLY IN THIS REGARD, IN ORDER TO EVALUATE AND MAKE ALLOWANCES WITHIN UNIT PRICES BID UNDER ITEM NO. 1 FOR RIGHT-OF-WAY RESTRICTIONS. LIMITED CLEARING WILL BE PERMITTED WITHIN THE EASEMENTS.



ALL MANHOLES IN UNIMPROVED AREAS ARE TO BE INSTALLED A MINIMUM OF 6" ABOVE THE GROUND SURFACE.

PLAN



PROFILE

NOTE:
THE GROUND PROFILE SHOWN IS THE APPROXIMATE GROUND PROFILE OVER THE PROPOSED INTERCEPTOR.

* PRESTRESSED CONC. CYLINDER PIPE EQUIVALENT TO CL. III, IV OR V R.C.P

SCALE IN FEET

FLETCHER N. PLATT JR.
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No 17594
DATE _____
DESIGNED _____ CHECKED FNP
APPROVED _____ DATE 4/24/79

RECORD PLAN
STANDARD ENG & CONSTRUCTORS, INC. CONTRACTOR
MARCH, 1979 - JULY, 1979 CONSTRUCTION PERIOD
RESIDENT ENGINEER DATE
3/6/79 REALIGNMENT / BLK 16 LOT 20
4/23/79 REVISE PIPE SIZE
DATE BRIEF
REVISIONS

ROCKAWAY VALLEY REGIONAL SEWERAGE AUTHORITY
MORRIS COUNTY, NEW JERSEY

ROCKAWAY RIVER REGIONAL INTERCEPTOR SEWER

PLAN AND PROFILE
WHARTON SECTION

ELSON T. KILLAM ASSOCIATES, INC.
Hydraulic and Sanitary Engineers · 48 ESSEX STREET, MILLBURN, NEW JERSEY 07041

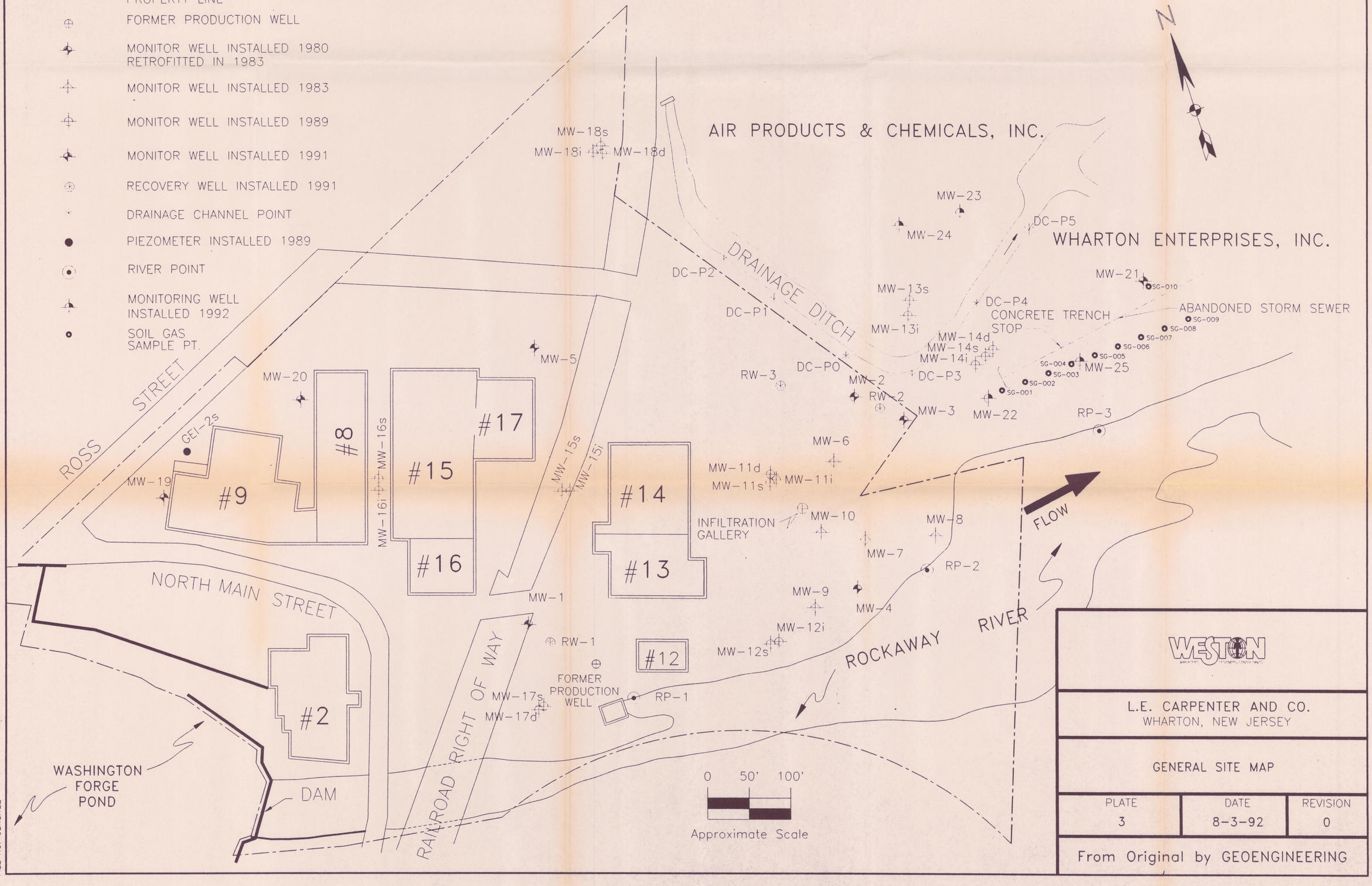
CONTRACT NO.	B/O	SHEET	JOB
V	4	PLATE 2	519-45

PRINT DATE

Approved made 4/17/79

LEGEND

- PROPERTY LINE
- FORMER PRODUCTION WELL
- MONITOR WELL INSTALLED 1980 RETROFITTED IN 1983
- MONITOR WELL INSTALLED 1983
- MONITOR WELL INSTALLED 1989
- MONITOR WELL INSTALLED 1991
- RECOVERY WELL INSTALLED 1991
- DRAINAGE CHANNEL POINT
- PIEZOMETER INSTALLED 1989
- RIVER POINT
- MONITORING WELL INSTALLED 1992
- SOIL GAS SAMPLE PT.



WESTON

L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY

GENERAL SITE MAP

PLATE	DATE	REVISION
3	8-3-92	0

From Original by GEOENGINEERING

FILE NO. GENSITE2

LEGEND

- PROPERTY LINE
- TEST PIT LOCATION
- HAND AUGER SAMPLE LOCATION
- SURFACE WATER(SW)/STEAM SEDIMENT(SS) SAMPLE LOCATION
- [ ] DUPLICATE RESULTS IN BRACKETS
- SEDIMENT SAMPLING LOCATION
- UNDERGROUND PIPING
- STORAGE TANKS
- PAVED AREA

NOTES:

1. GENERAL SITE PLAN WAS BASED ON AND ADAPTED FROM THE FOLLOWING DRAWINGS:
   a.) LOCATION AND ELEVATION OF MONITOR WELLS, L.E. CARPENTER AND COMPANY PROPERTY", BY RECON, INC., DATED OCTOBER 31, 1989.
   b.) "MAP OF L.E. CARPENTER & COMPANY PROPERTY", BY RAYMOND SHARP, DATED APRIL 12, 1943, REVISED JUNE 12, 1970
   c.) "PLOT PLAN-PROPERTY OF L.E. CARPENTER & CO.", BY RAYMOND SHARP, DATED APRIL 23, 1973.
   d.) "EXISTING PLANT LAYOUT", L.E. CARPENTER & CO., DRAWING No. A2, DATED MARCH 15, 1973.
   e.) "SITE PLAN", BY WEHRAN ENGINEERING CORP., DATED FEBRUARY 6, 1976
   f.) "ROCKAWAY RIVER REGIONAL INTERCEPTOR SEWER, WHARTON SECTION", BY E.T. KILLAM AND ASSOCIATES, INC., DATED APRIL 24, 1978.
   g.) "ROCKAWAY RIVER REGIONAL INTERCEPTOR SEWER, WHARTON REALIGNMENT", BY E.T. KILLAM AND ASSOCIATES, INC., DATED APRIL 20, 1981
2. UNDERGROUND PIPING, STORAGE TANKS, FORMER STARCH DRYING BEDS, RAILROAD RIGHT OF WAY, AND TRANSFORMER LOCATIONS ARE APPROXIMATE.
3. SHALLOW SOIL SAMPLES COLLECTED AT GROUND SURFACE OR IMMEDIATELY BENEATH ASPHALT.

AIR PRODUCTS & CHEMICALS, INC.

WHARTON ENTERPRISES, INC.

ROSS STREET

NORTH MAIN STREET

RAILROAD RIGHT OF WAY

ROCKAWAY RIVER

FLOW

WASHINGTON FORGE POND

DAM

FORMER NON-CONTACT COOLING WATER DISCHARGE POINT

FORMER STARCH DRYING BEDS

FENCE

DRAINAGE DITCH

CATCH BASIN

MH

DE-SIZING PROCESS WASTE TANK

SANITARY SEWER CONNECTION (1965)

LOADING DOCK

FLOOR DRAIN

BLDG. 8

BLDG. 9

RAW MATERIAL: DRUM STORAGE

PRINT DEPT.

LAMINATION DEPT.

INSPECTION/STORAGE/ DISTRIBUTION

BLDG. 17

BLDG. 15

OFFICES

BLDG. 16

3 - 167 KVA TRANSFORMERS (L.E.C. & CO.)

BLDG. 14

COATING DEPT.

COMPOUNDING DEPT.

RAW MATERIAL BAG & DRUM STORAGE BLDG. 13

TANK FARM

TANK LINE ENTRY TO BLDG. 13

FLOOR DRAIN DISCHARGE POINT

FORMER IMPOUNDMENT AREA (1963-1970)

BLDG. 12

FLOOR DRAIN

FORMER BOILER BLOWDOWN DISCHARGE POINT

STEEL PENSTOCK

OFFICES

BLDG. 2

RETAINING WALL

BACKFILLED MANHOLE

MASONRY PIPE PLUG

STEEL END PLUG

CONCRETE TRENCH STOP

ROCKAWAY VALLEY REGIONAL SEWER AUTHORITY 24" DIA. SANITARY SEWER LINE (ABANDONED)

SW-1 SS-1
SW-2 SS-2
SW-3 SS-3
SW-4 SS-4
SW-5 SS-5
SW-6 SS-6
SW-7 SS-7
SW-8 SS-8
SW-9 SS-9
SW-10 SS-10
SS-2-1
SS-2-2
SS-2-3
SS-2-4
SS-2-5
SS-2-6

STORAGE TANK INVENTORY

TANK ID	CONTENTS	VOLUME (gal.)
1	NAPTHA	15,000
2	WASTE XYLENE	15,000
3	DIOCTYL PHTHALATE(DEHP)	15,000
4	XYLENE	15,000
5	TEXANOL (TXIB)	3,000
6	PLASTICIZER-1KO (BBP)	3,000
7	EPOXIDIZED SOY BEAN OIL	10,000
E-1	No. 6 FUEL OIL	10,000
E-2	No. 6 FUEL OIL	30,000
E-3	WASTE MEK & PIGMENTS	10,000
E-4	MEK	10,000
E-5	SMOG HOG CONDENSATE	550
E-6	SMOG HOG CONDENSATE	550
E-7	SMOG HOG CONDENSATE	550
E-8	SMOG HOG CONDENSATE	550
E-9	No. 2 FUEL OIL	550

0 25' 50'
Approximate Scale

L.E. CARPENTER AND CO.
MAP SHOWING TEST PIT, HAND AUGER, SEDIMENT AND SURFACE WATER SAMPLING LOCATIONS

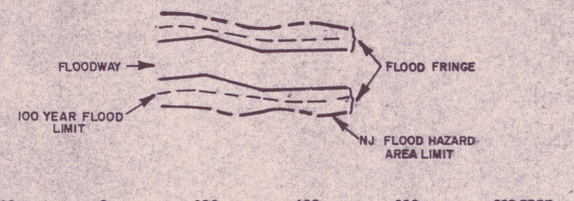
PLATE 4	DATE 1/18/91	REVISION 1

From Original by GEOENGINEERING

FILE: SUPSAMP1

01/27/91 4

PLAN LEGEND



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

DELINEATION OF FLOODWAY AND FLOOD HAZARD AREA

ROCKAWAY RIVER—GREEN POND BROOK

Sta. 1284+00 To Sta. 1320+90 Sta 0+00 To Sta. 35+00

ROCKAWAY TOWNSHIP, WHARTON BOROUGH, DOVER TOWN,
MORRIS COUNTY, NEW JERSEY

FLOODWAY LIMIT

100 YEAR FLOOD PLAIN

FLOOD HAZARD AREA LIMIT

PLATE 1